

1 Jeff D. Friedman (173886)
2 Rio S. Pierce (298297)
HAGENS BERMAN SOBOL SHAPIRO LLP
3 715 Hearst Avenue, Suite 202
Berkeley, CA 94710
Telephone: (510) 725-3000
4 Facsimile: (510) 725-3001
jefff@hbsslaw.com
5 riop@hbsslaw.com

6 Simon Bahne Paris (*Pro Hac Vice forthcoming*)
7 Patrick Howard (*Pro Hac Vice forthcoming*)
Charles J. Kocher (*Pro Hac Vice forthcoming*)
SALTZ, MONGELUZZI, BARRETT
8 & BENDESKY, P.C.
One Liberty Place, 52nd Floor
9 1650 Market Place
Philadelphia, PA19103
10 Telephone: (215) 575-3986
Facsimile: (215) 496-0999
11 sparis@smbb.com
phoward@smbb.com
12 ckocher@smbb.com

13 *Attorneys for Plaintiffs*

14 [Additional Counsel on Sig. Page]

15 UNITED STATES DISTRICT COURT
16 NORTHERN DISTRICT OF CALIFORNIA

17 BRITTANY D'AMORE, JOSEPH
18 REALDINE, individually and on behalf of all
others similarly situated,

19 Plaintiffs,

20 v.

21 MICRON TECHNOLOGY, INC., MICRON
22 SEMICONDUCTOR PRODUCTS, INC.,
SAMSUNG ELECTRONICS CO., LTD.,
23 SAMSUNG SEMICONDUCTOR, INC., SK
HYNIX, INC. (F/K/A HYNIX
24 SEMICONDUCTOR, INC.), SK HYNIX
AMERICA, INC. (F/K/A HYNIX
25 SEMICONDUCTOR AMERICA, INC.),

26 Defendants.

27 Case No.

28 CLASS ACTION COMPLAINT

JURY TRIAL DEMANDED

TABLE OF CONTENTS

	<u>Page</u>
I. OVERVIEW OF THE CONSPIRACY.....	1
II. JURISDICTION AND VENUE.....	5
III. THE PARTIES	7
A. Plaintiffs	7
B. Defendants	7
C. Agents and Non-Party Co-Conspirators	9
IV. DESCRIPTION OF DRAM	9
A. What is DRAM?	9
B. How is DRAM Manufactured?	10
C. How is DRAM Sold to Direct Purchasers?	11
D. How is DRAM Sold to Indirect Purchasers?.....	13
V. DEFENDANTS CONSPIRED TO RESTRAIN COMPETITION FOR SALES OF DRAM.....	13
A. Prior to the Start of the Class Period, Defendants Made Independent Supply and Capacity Decisions, Leading to Declining DRAM Prices	13
1. Between August 2014 and May 2016, competition between Defendants caused DRAM prices to decline.....	13
2. Defendants' Supply and Pricing behavior changed abruptly and nearly simultaneously at the beginning of the Class Period.....	14
a. Samsung in 2016 responded to Micron's invitations, changed its behavior, and stopped growing supply in an attempt to take market share.....	15
b. In 2015, the Defendants grew supply at the same rate as their forecasted growth in demand but starting in 2016 Defendants intentionally restricted supply so that it grew slower than demand.	17
B. The Class Period Begins on June 1, 2016, as Defendants' Efforts to Coordinate to Ensure Capacity Discipline and DRAM Price Increases Began to Bear Fruit.....	18
1. Defendants engaged in concerted signaling to each other through public statements and actions in response that	

1	effectuated an agreement between Defendants to artificially restrict supply growth of DRAM – causing DRAM prices to skyrocket	18
2		
3	2. Defendants' public statements.....	19
4		
5	3. Throughout 2017, Defendants repeatedly reassured each other that, unlike in previous periods, each would not respond to rising prices and strong demand with increased supply growth. Instead, the Defendants would stick with their publicly announced plans to keep supply growth below demand growth by not adding wafer capacity and not seeking to take market share from each other.	34
6		
7		
8	C. End of Conspiracy: Once Chinese Investigation was Announced, Defendants' Conduct Changed Abruptly	35
9		
10	VI. THE STRUCTURE OF THE DRAM INDUSTRY IS CONDUCIVE TO CONSPIRACY	37
11		
12	A. DRAM is a Commodity Product	37
13	B. The DRAM Market is Highly Concentrated	38
14	C. The DRAM Market Has High Barriers to Entry	41
15		
16	1. Defendants own the intellectual property for DRAM through cross-licenses, patents, and joint ventures	41
17	2. DRAM manufacturers have the benefit of economies of scale	43
18	D. Demand for DRAM is Inelastic.....	44
19	E. Defendants' Increased Prices for DRAM Cannot Be Explained by Market Errors.....	45
20		
21	1. DRAM costs remained low or stable during Class Period	45
22	2. Price increases during the Class Period cannot be explained by the technology life cycle.....	45
23	F. The Defendants' Profits Increased During the Class Period	48
24		
25	1. Trade association participation provide many opportunities for Defendants to share information and collude	48
26	a. Semiconductor Industry Association ("SIA")	48
27	b. Korean Semiconductor Industry Association ("KSIA").....	49
28	c. World Semiconductor Council ("WSC")	50

1	d.	World Semiconductor Trade Statistics Organization ("WSTS")	50
2	e.	Global Semiconductor Alliance ("GSA")	52
3	2.	Trade association meetings in which Defendants participate can be correlated with price increases during the Class Period.....	52
4			
5	VII.	DEFENDANTS' PRIOR COLLUSION IN THE DRAM MARKET, AND RELATED MARKETS, MAKES COLLUSION EVEN MORE PLAUSIBLE HERE	54
6			
7	A.	Defendants Were Previously Convicted for Fixing Prices of DRAM	54
8			
9	1.	Prior DRAM – Other Regulators.....	57
10	2.	Prior DRAM Civil Cases (Direct and Indirect).....	58
11	B.	Other Semiconductor Memory Products	58
12			
13	1.	SRAM.....	58
14			
15	2.	Flash	59
16	VIII.	EFFECTS OF DEFENDANTS' MISCONDUCT	60
17			
18	A.	The Inflated Prices for DRAM caused by Defendants' Conduct Passed on to Consumers	60
19			
20	IX.	CLASS ACTION ALLEGATIONS	62
21	X.	VIOLATIONS ALLEGED	67
22	FIRST CLAIM FOR RELIEF (VIOLATIONS OF SHERMAN ACT, 15 U.S.C. § 1).....	67	
23	SECOND CLAIM FOR RELIEF (VIOLATIONS OF THE CARTWRIGHT ACT, CAL. BUS. & PROF. CODE §§ 16720, <i>ET SEQ.</i>).....	68	
24	THIRD CLAIM FOR RELIEF (VIOLATIONS OF CALIFORNIA'S UNFAIR COMPETITION LAW, CAL. BUS. & PROF. CODE §§ 17200, <i>ET SEQ.</i>).....	69	
25	FOURTH CLAIM FOR RELIEF (VIOLATIONS OF STATE ANTITRUST AND RESTRAINT OF TRADE LAWS)	70	
26	DEMAND FOR TRIAL BY JURY	73	
27	PRAYER FOR RELIEF	73	
28			

1 Plaintiffs bring this action on their own behalf, and as a putative class action on behalf of all
 2 others similarly situated. Plaintiffs, by and through their attorneys, based on their individual
 3 experiences, the independent investigation of counsel and consultants, and information and belief,
 4 allege as follows:

5 I. OVERVIEW OF THE CONSPIRACY

6 1. Dynamic random access memory (“DRAM”) is one of the most common forms of
 7 semiconductor memory. DRAM is made from silicon wafers, and is widely used as a component in
 8 digital electronics, such as in mobile phones, PCs and servers, laptops, tablets, TVs, set-top boxes,
 9 cameras, and in industrial applications, such as in automotive, military, and aviation devices.

10 2. The alleged co-conspirators, Samsung, Micron, and Hynix, are the three companies
 11 that control nearly one-hundred percent of the DRAM market. Defendants¹ are the world’s largest
 12 manufacturers of DRAM, collectively controlling 96% of worldwide DRAM market share as of mid-
 13 2017.

14 3. Defendants combined and contracted to fix, raise, maintain, or stabilize the prices at
 15 which DRAM was sold in the United States from at least June 1, 2016 to February 1, 2018 (the
 16 “Class Period”). Defendants’ conspiracy artificially inflated prices for DRAM throughout the supply
 17 chain that were ultimately passed through to Plaintiffs and the Class, causing them to pay more for
 18 DRAM Products than they otherwise would have absent Defendants’ conspiracy.

19 4. Prior to entering into the conspiracy, Defendants acted independently in deciding how
 20 to balance supply (and capacity) to meet industry demand for DRAM. Acting independently, firms
 21 sought to gain market share through increases in their supply.

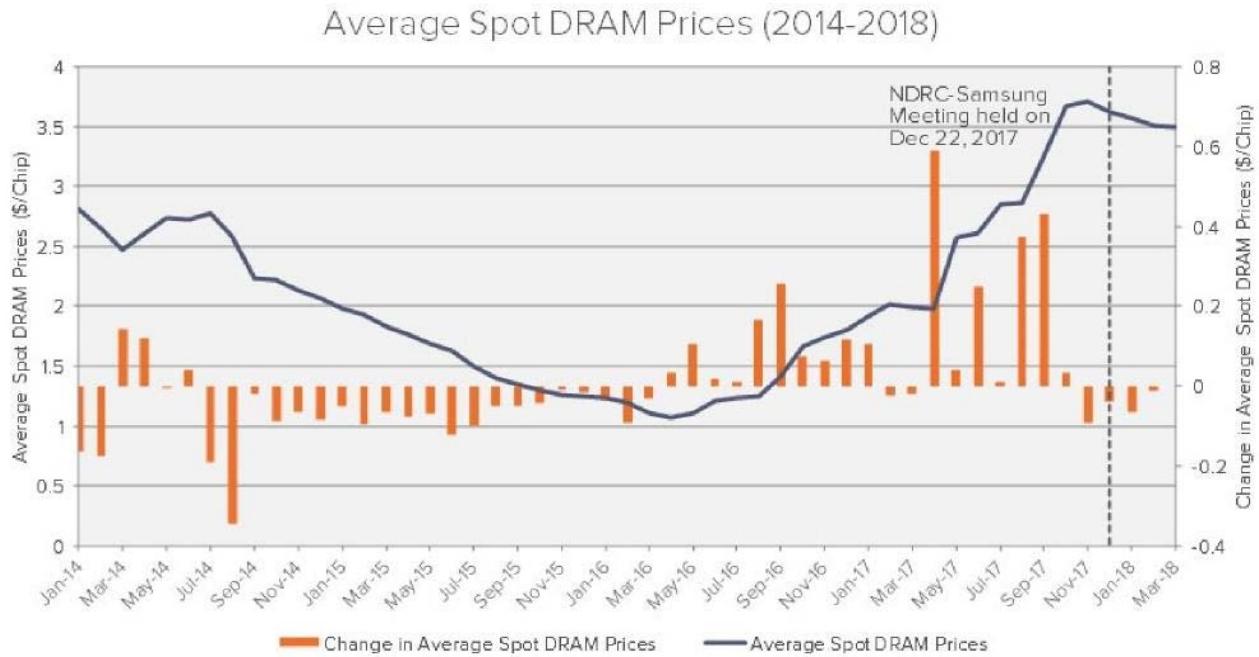
22 5. For example, during the period from 2014-2015, the Defendant Samsung added wafer
 23 capacity throughout the period in an attempt to take market share from the other Defendants. DRAM
 24 prices fell during this time.

25
 26 1 “Defendants” include: Micron Technology, Inc. (“Micron Technology”); Micron
 27 Semiconductor Products, Inc. (“Micron Semiconductor”) (collectively “Micron”); Samsung
 28 Electronics Co., Ltd. (“SEC”); Samsung Semiconductor, Inc. (“SSI”) (collectively “Samsung”); SK
 Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”); and SK Hynix America, Inc.
 (f/k/a Hynix Semiconductor America, Inc.) (“SK Hynix America”) (collectively “SK Hynix”).

1 6. But in the face of the willingness of the three firms controlling the DRAM market to
 2 steal market share through price competition (and supply increases), Defendants made a near
 3 simultaneous decision in 2016 to restrict growth in the supply of DRAM to stop the downward
 4 pressure on prices and, indeed, to cause DRAM prices to skyrocket upward. Beginning no later than
 5 early 2016, through statements to investors and the industry, Micron called on Samsung and SK
 6 Hynix (the two other DRAM manufacturers) to engage in supply discipline. For example, on March
 7 30, 2016, Micron was specifically asked whether it would engage in supply cuts and Micron's CEO,
 8 Mark Durcan, responded that Micron would "be foolish to be the first ones to take capacity off."
 9 Micron's CFO, Ernie Maddock, further confirmed that Micron would not unilaterally cut production:
 10 "it's a really ill-advised move to be unilaterally cutting production." But, at the same time, Micron
 11 reassured competitors that "our focus is not on market share." Micron told its competitors that it
 12 would cease trying to take market share from Samsung and Hynix. On April 28, 2016, Samsung
 13 responded to Micron's invitation to cut supply by publicly announcing that its DRAM supply growth
 14 had turned negative. After these communications, by June 1, 2016, DRAM prices reversed course,
 15 started shooting upwards, and continued to do so throughout the Class Period.

16 7. During the Class Period, Defendants continued their efforts to coordinate their DRAM
 17 supply decisions, as reflected in public comments by Defendants that urged each other to keep
 18 industry supply in check. Defendants each made public statements affirming their commitment to
 19 the common plan to curtail supply, and to not compete for each other's market share by supply
 20 expansion. For example, Defendants informed the other Defendants through public statements, that
 21 they would ***keep total wafer capacity flat*** in order to constrain DRAM supply growth, they would
 22 only ***grow DRAM supply between 15-20% in 2017, even as DRAM demand grew 20-25%***, and that
 23 they would ***refrain from taking each other's market share***. Defendants' statements were matched
 24 with conduct – affirmed in industry reports and analyses – which reinforced each's commitment to
 25 their common scheme. As a result of Defendants' concerted actions to curtail supply and forego
 26
 27
 28

1 market share expansion, Defendants were able to raise DRAM prices steadily throughout the Class
 2 Period, and reap enormous profits, as shown in the chart below.



8. On December 27, 2017, Reuters reported that China's economic regulator, the National Development and Reform Commission ("NDRC"), had begun an investigation into price-fixing by Defendants in the DRAM/NAND Industry following the sharp rise in the price of memory chips over the period from June 1, 2016 to December 2017. On December 22, 2017, the NDRC and Samsung held a meeting regarding coordinated action among the Defendants in the DRAM industry. On February 1, 2018, it was reported that Samsung and the NDRC had entered into a Memorandum of Understanding where Samsung agreed to increase manufacturing capacity. The NDRC investigation and the agreement with Samsung caused Defendants' conduct to change as they increased capacity and the Class Period came to an end after February 1, 2018. DRAM prices fell as a result of the change in behavior. For example, following the end of the Class Period, Hynix announced in April 2018 that it was adding wafer capacity in order to match increased demand – a change from the practice of the Defendants during the Class Period where they kept wafer capacity flat despite increasing demand.

9. During the Class Period as a result of the scheme, prices soared. For example, the price of a mainstream 4GB DRAM rose 130%.

1 10. During the Class Period, as prices for DRAM soared, so did Defendants' revenue.
 2 Defendants' revenue from global DRAM sales skyrocketed during the Class Period, with
 3 Defendants' revenue rising more than 50%. Between Q1 2016 and Q3 2017, Defendants' revenues
 4 from global DRAM sales more than doubled. In Q3 2017, Samsung achieved a record-high revenue
 5 of \$8.7 billion from its global DRAM sales (Q1 2016 revenue was \$3.9 billion); SK Hynix achieved
 6 record-high revenue of \$5.5 billion from its global DRAM sales (Q1 2016 revenue was \$2.3 billion),
 7 and Micron achieved record-high revenue of \$4.0 billion from its global DRAM sales (Q1 2016
 8 revenue was \$1.5 billion).

9 11. In addition to Defendants' near-simultaneous change in behavior, leading to severe
 10 price increases during the alleged Class Period, other "plus factors" also point squarely to collusion
 11 by Defendants. For example, the DRAM market had all the hallmark features of a market conducive
 12 to collusion. DRAM is a commodity. The DRAM market is consolidated, with only a small number
 13 of players – the three Defendants – holding a lion's share of the market (96%). The DRAM market
 14 has high barriers to entry, and demand for DRAM is inelastic. While DRAM prices rose during the
 15 Class Period, costs did not rise so as to justify those increases, nor did changes in DRAM
 16 technology. There is also an ease of information sharing that is pervasive in the DRAM market.
 17 Defendants had many opportunities to collude through common participation in trade associations
 18 and industry groups, and through their overlapping business relationships. Defendants also had the
 19 ability to track and monitor each other's price and supply movements, before the public had access to
 20 that same information, through DRAMeXchange – an industry mechanism tracking Defendants'
 21 pricing and capacity movements, and to which Defendants all subscribe.

22 12. The plausibility of the conspiracy alleged herein is also buttressed by the fact that
 23 ***Defendants have previously been convicted for conspiring to fix prices of DRAM.*** In 2005, the
 24 United States Department of Justice ("DOJ") brought criminal charges against the very same
 25 Defendants as named here (and other makers of DRAM that existed at the time) for participating in a
 26 conspiracy to fix prices of DRAM sold in the United States between 1999 and 2002. Samsung and
 27
 28

1 SK Hynix² pleaded guilty to the DOJ’s charges – and paid some of the largest criminal fines in
 2 history for their illegal conduct. Micron also admitted its participation in the earlier DRAM
 3 conspiracy, but was given amnesty from DOJ prosecution in exchange for its cooperation under the
 4 DOJ’s Antitrust Leniency Program.³ Fourteen individual employees of Defendants also pleaded
 5 guilty for their participation in the earlier DRAM conspiracy – paying fines of \$250,000 each, and
 6 serving prison sentences ranging from seven to fourteen months. Defendants and their co-
 7 conspirators also collectively paid over \$650 million to settle civil price-fixing claims related to their
 8 prior conduct in the DRAM market. In fact, a number of Defendants’ employees who were involved
 9 in collusive acts during the last DRAM conspiracy are still in key leadership positions at Defendants
 10 today. Defendants have also been investigated by the DOJ for fixing prices in similar semiconductor
 11 memory markets, including the markets for static random access memory (“SRAM”) and NAND
 12 (generally referred to as “Flash”) and, Defendant Samsung Electronics Co., Ltd. and its various
 13 wholly owned subsidiaries pleaded guilty in a number of other landmark electronic component price-
 14 fixing conspiracies. Given the repeated history of antitrust violations by Defendants in the DRAM
 15 market, and in related electronic component markets, it is even more plausible that Defendants
 16 conspired to restrict supply here, and thereby to raise or keep prices of DRAM artificially high
 17 during the Class Period, and reap high profits once again.

18 13. Defendants’ conspiratorial conduct between 2016-2018 violated Section One of the
 19 Sherman Act and the antitrust, consumer protection, and unfair competition laws of various states.
 20 As a result, Plaintiffs and the Class paid artificially inflated prices for DRAM Products, and thereby
 21 suffered antitrust injury to their business or property.

22 **II. JURISDICTION AND VENUE**

23 14. This Court has jurisdiction over the instant matter pursuant to 28 U.S.C. § 1332(d)
 24 and the Class Action Fairness Act of 2005 (“CAFA”), 28 U.S.C. § 1711, et seq., which vest original

25 ² In 2012, Hynix Semiconductor, Inc. and Hynix Semiconductor America, Inc. changed their
 26 corporate names to SK Hynix, Inc. and SK Hynix America, Inc., respectively, after the companies
 27 were acquired by SK Group. For simplicity, this Complaint uses the term “SK Hynix” throughout.

28 ³ Under the DOJ’s Antitrust Leniency Program, a “leniency applicant” can receive amnesty from
 29 criminal prosecution and/or reduced fines, for admitting its own violations and cooperating with
 30 authorities.

1 jurisdiction in the district courts of the United States for any multi-state class action where the
 2 aggregate amount in controversy exceeds \$5 million and where the citizenship of any member of the
 3 class of plaintiffs is different from that of any defendant. The \$5 million amount-in-controversy and
 4 diverse citizenship requirements of CAFA are satisfied in this case.

5 15. Venue is appropriate in this district under 28 U.S.C. § 1331(b) and (c). During the
 6 Class Period many of the Defendants transacted business, were found, or had agents in this district
 7 and because a substantial portion of the affected interstate trade and commerce described below has
 8 been carried out in this district.

9 16. This Court has personal jurisdiction over each Defendant because, *inter alia*, each
 10 Defendant: (a) transacted business throughout the United States, including in this district; (b)
 11 participated in the sale and distribution of DRAM or DRAM-containing products throughout the
 12 United States, including in this district; (c) had substantial contacts with the United States, including
 13 in this district; and/or (d) was engaged in an illegal conspiracy that was directed at and had the
 14 intended effect of causing injury to persons residing in, located in, or doing business throughout the
 15 United States, including in this district.

16 17. Defendants engaged in conduct both inside and outside the U.S. that caused direct,
 17 substantial and reasonably foreseeable and intended anti-competitive effects upon interstate
 18 commerce within the United States.

19 18. The activities of the Defendants were within the flow of, were intended to, and did
 20 have, a substantial effect on interstate commerce of the United States. Defendants' products are sold
 21 in the flow of interstate commerce.

22 19. As described above in the previous section in more detail, DRAM manufactured
 23 abroad by Defendants and sold for use in products that contain DRAM, either manufactured in the
 24 United States or manufactured abroad and sold in the United States, are goods brought into the
 25 United States for sale, and therefore constitute import commerce. To the extent any DRAM was not
 26 purchased in the United States and do not constitute import commerce, Defendants' unlawful
 27 activities with respect thereto, as more fully alleged herein during the Class Period, had, and continue
 28 to have, a direct, substantial and reasonably foreseeable effect on United States commerce. The anti-

competitive conduct, and its effects on United States commerce described herein, proximately caused antitrust injury to the Plaintiffs and members of the Classes in the United States.

20. By reason of the unlawful activities alleged herein, Defendants substantially affected commerce throughout the United States, causing injury to the Plaintiffs and members of the Class. Defendants, directly and through their agents, engaged in a conspiracy affecting all states to fix or inflate prices of DRAM, which unreasonably restrained trade and adversely affected the market for DRAM.

21. Defendants' conspiracy and wrongdoing described herein adversely affected persons in the United States who purchased DRAM or products containing DRAM for personal use and not for resale, including Plaintiffs and members of the Class.

III. THE PARTIES

A. Plaintiffs

22. Plaintiff Brittany D'Amore is a resident of Drexel Hill, Pennsylvania. During the Class Period, Plaintiff D'Amore purchased a product containing DRAM manufactured for personal use and not for resale.

23. Plaintiff Joseph P. Realidine is a resident of Haleiwa, Hawaii. During the Class Period, Plaintiff Realidine purchased a product containing DRAM manufactured for personal use and not for resale.

B. Defendants

24. Defendant Micron Technology, Inc. (“Micron Technology”) is a Delaware corporation with its principal place of business at 8000 South Federal Way, Boise, Idaho. During the Class Period, Micron Technology manufactured, sold, and distributed DRAM throughout the United States.

25. Defendant Micron Semiconductor Products, Inc. (“Micron Semiconductor”) is an Idaho corporation located at 8000 South Federal Way, Boise, Idaho. Micron Semiconductor is a wholly owned and controlled subsidiary of Micron Technology. During the Class Period, Micron Semiconductor sold and distributed DRAM to customers throughout the United States, including

1 sales of DRAM through its retailing arm, Crucial Technology, Inc. (“Crucial”), and Crucial’s
2 website, Crucial.com.

3 26. Defendants Micron Technology and Micron Semiconductor, and Crucial are
4 collectively referred to herein as “Micron.”

5 27. Defendant Samsung Electronics Co., Ltd. (“SEC”) is a Korean corporation and
6 maintains its executive offices at 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, Korea.
7 During the Class Period, SEC manufactured, sold and distributed DRAM throughout the world,
8 including the United States.

9 28. Defendant Samsung Semiconductor, Inc. (“SSI”) is a California corporation located at
10 3655 North First Street, San Jose, California 95134. SSI is a wholly owned and controlled
11 subsidiary of SEC. During the Class Period, SSI sold and distributed DRAM throughout the United
12 States.

13 29. Defendants SEC and SSI are collectively referred to herein as “Samsung.”

14 30. Defendant SK Hynix, Inc. (f/k/a Hynix Semiconductor, Inc.) (“SK Hynix Korea”)
15 maintains its head offices at SAN 136-1, Ami-Ri Bubal-eub, Ichon-si, Kyoungki-do, Korea. During
16 the Class Period, SK Hynix Korea manufactured, sold and distributed DRAM throughout the world,
17 including the United States.

18 31. Defendant SK Hynix America, Inc. (f/k/a Hynix Semiconductor America, Inc.) (“SK
19 Hynix America”) is a California corporation located at 3101 North First Street, San Jose, California
20 95134. SK Hynix America is a wholly owned and controlled subsidiary of SK Hynix Korea. During
21 the Class Period, SK Hynix America sold and distributed DRAM throughout the United States.

22 32. Defendants SK Hynix and SK Hynix America are collectively referred to herein as
23 “SK Hynix.”

24 33. SEC and SK Hynix Korea identified above, are at times referred to herein as the
25 “Korean Defendants.”

26 34. The Micron Defendant entities, SSI and SK Hynix America identified above, are at
27 times referred to herein as “U.S. Defendants.”

C. Agents and Non-Party Co-Conspirators

35. Defendants' officers, directors, agents, employees, or representatives engaged in the conduct alleged in this Complaint in the usual management, direction, or control of Defendants' business or affairs.

36. Defendants are also liable for acts done in furtherance of the alleged conspiracy by companies they acquired through mergers and acquisitions.

37. When Plaintiffs refer to a corporate family or companies by a single name in this Complaint, Plaintiffs are alleging that one or more employees or agents of entities within that corporate family engaged in conspiratorial acts on behalf of every company in that family. The individual participants in the conspiratorial acts did not always know the corporate affiliation of their counterparts, nor did they distinguish between the entities within a corporate family. The individual participants entered into agreements on behalf of their respective corporate families. As a result, those agents represented the entire corporate family with respect to such conduct, and the corporate family was party to the agreements that those agents reached.

38. Each of the Defendants acted as the agent of, co-conspirator with, or joint venture partner of the other Defendants and co-conspirators with respect to the acts, violations and common course of conduct alleged in this Complaint. Each Defendant or co-conspirator that is a subsidiary of a foreign parent acted as the United States agent for DRAM and/or DRAM Products made by its parent company.

39. Various persons, partnerships, sole proprietors, firms, corporations, and individuals not named as Defendants in this lawsuit, and individuals, both known and unknown, participated as co-conspirators with Defendants in the offenses alleged in this Complaint, and performed acts and made statements in furtherance of the conspiracy. Plaintiffs reserve the right to name some or all of these persons and entities as Defendants at a later date.

IV. DESCRIPTION OF DRAM

A. What is DRAM?

40. DRAM is one of the most common forms of semiconductor memory. DRAM is used to store bits of data in capacitors, which are situated within integrated circuits. DRAM is widely used

1 in digital electronics, such as in mobile phones, PCs and servers, tablets, TVs, cameras, and also in
2 industrial applications, such as in automotive, military and aviation devices.

3 41. “RAM” or “Random Access Memory” is the memory or information storage in a
4 computer that is used to store running programs and data for the programs. Data (information) in the
5 RAM can be read and written quickly in any order. Normally, the RAM is in the form of computer
6 chips, such as DRAM. The “D” in DRAM stands for “dynamic,” meaning that it is a dynamic form
7 of RAM that must have its storage cells refreshed or given a new electronic charge every few
8 milliseconds, or data contained in the DRAM will be lost.

9 42. DRAM is a stand-alone product. In other words, it must be inserted into a device,
10 such as a laptop or a mobile phone, to serve any function:



22 43. Because DRAM has no independent utility, the value of, and thus, demand for DRAM
23 is driven by the demand for products that need volatile (or dynamic) memory.

24 **B. How is DRAM Manufactured?**

25 44. Defendants manufacture DRAM in fabrication plants (commonly called “fabs”).
26 Defendants manufacture DRAM at their fabs in Korea and China.

1 45. DRAM is made from silicon wafers. To make DRAM, silicon wafers are cut into
 2 individual chips called “dice.” The dice are printed with electronics, and are then considered
 3 complete. Capacity for DRAM is often discussed in terms of new “wafer starts.”

4 46. DRAM chips are classified into types based on the number of data transfers a chip can
 5 process per cycle. DRAM types are most commonly denoted by the term Double Data Rate
 6 (“DDR”), and are suffixed by numbers 2-6. For example, DRAM types include DDR3 and DDR4.

7 47. DRAM chips are also sometimes assembled by Defendants (or their contract agents)
 8 into DRAM modules, in order to be used in certain DRAM-containing devices. DRAM modules are
 9 a packaging option necessitated by, and developed for, the computer segment of the electronics
 10 market. A DRAM module is made from DRAM chips, a printed circuit board (“PCB”), and a
 11 bonding agent to attach the chips to the PCB. The vast majority of the cost of a DRAM module is
 12 the cost of chips. The close relationship between modules and chips is reflected by the price parity
 13 between them. At any given time, the price of modules is only slightly above the aggregate price of
 14 the loose chips mounted on the PCB.

15 48. DRAM is also classified into categories based on its end-use. For example, PC
 16 DRAM is used in PC related products such as in desktop and notebook products. Mobile DRAM is
 17 used in mobile devices, such as phones, smartphones, and tablets. Server DRAM is used in server
 18 applications, such as workstations and servers. There are other classifications that can be used in
 19 consumer devices such as TV, navigation, and digital/video camera devices, among other products.

20 **C. How is DRAM Sold to Direct Purchasers?**

21 49. The vast majority of DRAM is sold by Defendants to Original Equipment
 22 Manufacturers (“OEMs”), who then incorporate DRAM into the manufacturing of DRAM-
 23 containing products.

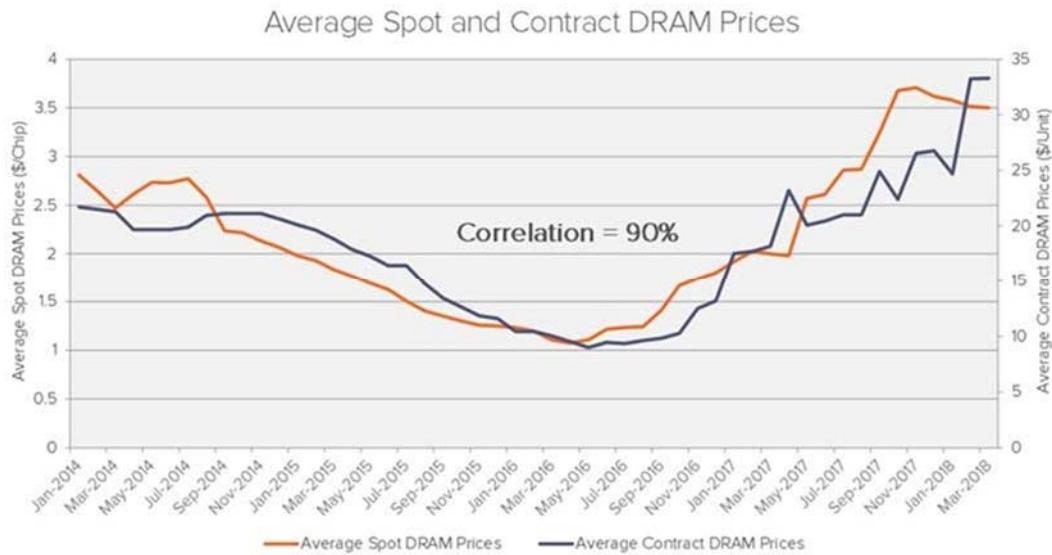
24 50. Micron sells some DRAM directly to consumers on its retail website, Crucial.com.

25 51. During the Class Period, approximately 90% of DRAM was sold pursuant to contracts
 26 between DRAM buyers and sellers, with the remaining 10% being sold on the spot market.

1 52. Contract prices are negotiated in advance, and specify the quantity of the product that
 2 will be delivered by the seller to the buyer over an agreed timeframe. Contracts last approximately
 3 two weeks to one month, when they can be renegotiated.

4 53. The spot market is an informal market consisting of intermediaries and vendors that
 5 sell DRAM to the white box PC segment,⁴ which is comprised primarily of Chinese manufacturers,
 6 unbranded PC manufacturers, and unbranded module makers.⁵

7 54. The spot and contract markets are sufficiently interrelated, with contract pricing being
 8 pegged to the spot price. Spot market pricing serves as an important benchmark for contract
 9 negotiations with OEMs. As subscribers to these services, each day, Defendants received these lists
 10 (before the general public), and used them as the benchmark for negotiating prices with contract
 11 customers. Therefore, when Defendants agreed to limit competition for the supply of DRAM, their
 12 conduct affected not just the spot price for DRAM but contract prices as well. As a result, contract
 13 prices and spot prices follow each other closely.



⁴ A white box is a PC or server without a well-known brand name. It applies to systems assembled by small system integrators and to home-built computer systems assembled by end users from parts purchased separately through a retail channel.

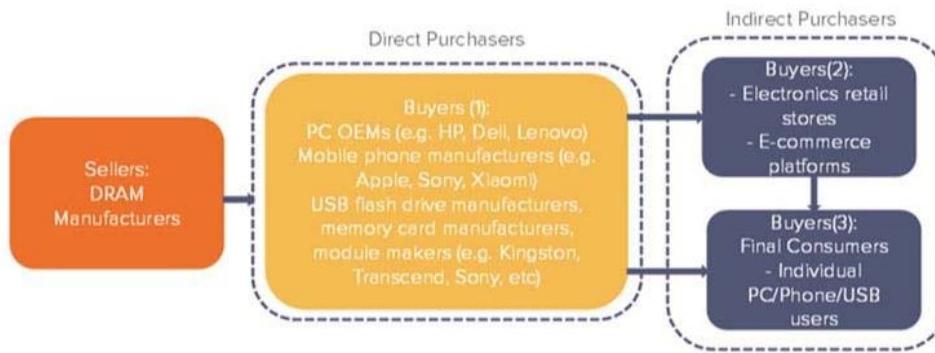
⁵ A module is a circuit board that contains DRAM integrated circuits that are installed into the memory slot on a computer motherboard.

1 **D. How is DRAM Sold to Indirect Purchasers?**

2 55. Direct purchasers of DRAM use DRAM in products that they manufacture, including
 3 computers and mobile phones. Final goods with embedded DRAM, such as laptops and phones, are
 4 then sold on to indirect purchasers of DRAM. The chart below sets forth an example of how DRAM
 5 is sold to indirect purchasers:

6 **DRAM Supply Chain**

- 7 ■ The majority of DRAM manufacturers sell to direct
 8 purchasers on a contract basis (i.e. based on contract price)
 9 ■ Final goods with embedded DRAM (e.g. laptops, phones,
 etc.) are then passed over to indirect purchasers



10 **V. DEFENDANTS CONSPIRED TO RESTRAIN COMPETITION
11 FOR SALES OF DRAM**

12 **A. Prior to the Start of the Class Period, Defendants Made Independent Supply and
13 Capacity Decisions, Leading to Declining DRAM Prices**

14 **1. Between August 2014 and May 2016, competition between Defendants caused
15 DRAM prices to decline**

16 56. Between May 2014 and August 2014, the average spot price for DRAM ranged
 17 between \$2.50 to \$2.70 per chip.

18 57. Between August 2014 and May 2016 (just prior to the start of the Class Period on
 19 June 1, 2016), the three Defendants responsible for nearly all DRAM supply competed by, among
 20 other things, seeking to increase their own market share at the expense of their competitors. This
 21 competition led to supply exceeding demand such that prices for DRAM were in decline. This price
 22 competition gave Defendants a strong motive to collude.

1 58. For example, between May 2014 and August 2014, average spot prices for DRAM
 2 were between \$2.50 and \$3.00 per chip. Those prices went down month-by-month, and, by May
 3 2016, average DRAM spot prices had fallen to \$1.00 per chip.

4 59. Between August 2014 and May 2016, prices for the most common types of DRAM –
 5 DDR3 and DDR – all declined steadily and precipitously. Average spot prices for DRAM from
 6 August 2014 to May 2016 declined by more than 57%. For example, from October 2014 to June
 7 2016, the average contact price of DDR3 4GB went down 62 percent, from \$32.75 to \$12.50.

8 **2. Defendants' Supply and Pricing behavior changed abruptly and nearly
 9 simultaneously at the beginning of the Class Period**

10 60. Prior to the start of the Class Period, Defendants appeared to engage in vigorous
 11 supply and price competition. For example, on July 31, 2014, Samsung, on its second quarter 2014
 12 earnings call, emphasized that it would be able to grow supply faster than that of the other
 13 Defendants and that this represented an opportunity for Samsung to capture market share: “our bit
 14 growth in second quarter was approximately 20% q-on-q and we expect for the third quarter the
 15 market DRAM bit growth will come in at high single digit and we will outgrow the market's bit
 16 growth. At this point we expect the DRAM market bit growth for 2014 to be low 30%s and we
 17 expect our bit growth for the year to be high 40%s … so while the market demand remains strong,
 18 the suppliers weren't able to bring on additional supply much more other than us, and therefore we
 19 were in a very good position to capture this opportunity.”

20 61. On October 30, 2014, Samsung, on its third quarter 2014 earnings call, announced
 21 that its policy in 2015 was grow supply faster than that of its competitors: ***“But our basic policy is
 22 that our bit growth rate next year should or would have to be higher than the industry. That is our
 23 goal.”***

24 62. On January 29, 2015, Samsung, on its fourth quarter 2014 earnings call, assured
 25 investors that it could grow supply quickly and take market share from its competitors: “We are
 26 expecting about mid 20% bit growth for market growth for DRAM and ***“our bit growth we believe
 27 will outgrow that of the market growth.”*** Samsung also said it had the capacity to increase
 28 production and would increase production if it saw shortages or increasing demand: “a shortage in

the industry would be great news...we will have signs to indicate a shortage coming forward, and so if we do see such signs such as the economy picking up or orders for other components picking up, *I think that we will find a way of capturing any shortage opportunities if they do materialize.*" Samsung emphasized that it intended to continue to outgrow the industry "so the main reason why we are planning and expecting to outgrow the industry is because we have better productivity compared to our competitors based on our technology leadership in terms of the manufacturing. That is the main reason why we're expecting to outgrow the industry."

63. Throughout 2015, Samsung repeatedly told the industry it was sticking to its plan of outgrowing the market. On October 29, 2015, Samsung, on its third quarter 2015 earnings call, reported that it had successfully executed its plans of outgrowing the market: “And for 2015 DRAM, we expect the market growth to be low to mid 20% and our bit growth for the year will low 30%.”

a. Samsung in 2016 responded to Micron's invitations, changed its behavior, and stopped growing supply in an attempt to take market share

64. On November 17, 2015, Micron's CFO, Ernie Maddock, at the UBS Global Technology Conference, forecast that Micron's competitors would make some "really rational decisions" involving "lower supply growth" and no "significant DRAM capacity expansion."

65. Again on December 22, 2015 at the first quarter 2016 earnings call, Micron’s CEO, Mark Durcan, emphasized that the “DRAM industry consist[s] of only three technology developers.” He suggested that Micron could “envision a future in which no additional DRAM wafer capacity is required.” Micron forecast bit growth rate for 2016 in the low 20% range. Micron’s comments represented an invitation to its competitors to stop adding significant wafer capacity – a suggestion that Samsung subsequently responded to by ceasing to take market share.

66. On January 29, 2016, Samsung, at the fourth quarter 2015 earnings call, responded to Micron's invitations by forecasting that it was growing in line with the market for the coming year: "For 2016, for the whole year, the DRAM market bit growth, we expect mid-20%, and our bit growth is expected to grow align with the market." Samsung's forecast growth rate matched that proposed by Micron several weeks earlier. Samsung stated that it was going to focus on profitability rather than market share in 2016: "And we will be able to grow our supply, we're planning, at market

1 growth levels. *This year our main focus will be on profitability rather than increasing volume.* So
 2 our main approach this year on the DRAM side is to maintain our leadership and also continue an
 3 operation that is sustainable and profitable.”

4 67. On May 25, 2016, just prior to the start of the conspiracy period, Micron CEO, Mark
 5 Durcan, at the J.P. Morgan Global Technology Media & Telecom Conference, stated that in 2014,
 6 Samsung “added some wafer probably more than they in retrospect would have.” Durcan claimed
 7 that while he did not “think the intention was to oversupply the market,” it caused the “market [to
 8 become] out of balance.”

9 68. On October 27, 2016 Samsung announced on its quarterly earnings call that its bit
 10 growth for 2017 will be in line with “market bit growth” and that “as we have always mentioned,
 11 regarding DRAM, *our focus is not to increase our market share but to* maximize *our profits*. And
 12 so our investments as well as production will also be flexibly managed according to how the market
 13 unfolds.”

14 69. In December 2016, with DRAM prices rising, Micron twice affirmed that Samsung
 15 had changed its behavior. On December 7, 2016, Micron Senior Vice President and Chief Financial
 16 Officer, Ernie Maddock, publicly stated at the Barclays Technology Conference that when it added
 17 DRAM capacity in 2014, that was the last time “supply came into the industry and that there was a
 18 new fab that was brought online by one of our competitors [Samsung].” Mr. Maddock lamented that
 19 those capacity additions had put “pricing pressure on the [DRAM] business” but that things were
 20 now different because “with the absence of capacity additions” in 2016 “now you’re back into this
 21 fundamentally healthier period.”

22 70. And, on December 21, 2016, Micron, on its first quarter 2017 earnings call, again
 23 signaled that the Defendants, including Samsung, had learned their lesson, and that this time – in the
 24 midst of the rising prices and steady demand – Defendants would not be adding supply as they did in
 25 2014. In answering a question as to why the current period would be different for the industry than
 26 what occurred in 2014, Mr. Maddock responded that in 2014 there was a “little bit of a
 27 miscalculation by one of the suppliers.” Maddock stated that he understood that Samsung had
 28 “learned from” that “miscalculation.”

1 71. By 2017, Samsung had completely reversed its prior pattern of competitively adding
 2 market share and had grown market share *less* than its competitors and was not planning to take
 3 market share from competitors despite its supply capacity. On October 31, 2017, Samsung stated on
 4 its quarterly earnings call that its bit growth for the year would be below market that year: “For
 5 DRAM, in the third quarter, our bit growth came in high single-digit and our ASP grew high single-
 6 digit as well. For the Q4, we expect market DRAM bit growth to be low single-digit and we expect
 7 our growth to be similar. That will bring the 2017 market DRAM bit growth to be approximately
 8 20% and our bit growth will be mid-teens.” An analyst noted that this was the first year that
 9 Samsung had lost market share; Samsung implied it had no plans to try to outgrow the market to take
 10 back market share. “Q: this is the first time that Samsung Electronics has lost market share in
 11 DRAM? Does it plan to regain its previous market share next year or will you be more trying to
 12 maintain where you stand currently? A: It’s a bit too early for us to give you specifics about what we
 13 plan to do with DRAM, but the current guidance that we can give you is that for next year, ***our bit***
 14 ***growth for DRAM is expected to be at market growth levels.***”

15 **b. In 2015, the Defendants grew supply at the same rate as their forecasted**
 16 **growth in demand but starting in 2016 Defendants intentionally restricted**
supply so that it grew slower than demand

17 72. On September 8, 2015, Ernie Maddock, Micron’s CFO, said at the Citi Global
 18 Technology Conference, that DRAM supply and demand would both grow in the mid 20% range for
 19 2016: “***we continue to see supply and demand in the DRAM space in relative balance of aggregate***
bit growth in sort of that mid-20% range as we look at 2016...” Micron reiterated “the way we are
 21 thinking about ’16 as I mentioned earlier in DRAM is sort of 20% to 30% bit growth by the industry
 22 and similar increase in demand.”

23 73. On December 1, 2015, Micron’s CFO, Ernie Maddock said at the Credit Suisse
 24 Technology, Media & Telecom Brokers Conference that supply and demand would be balanced in
 25 2016: “if you look at the DRAM front based upon what we’ve talked about and the public
 26 announcement of our competitors it feels very much like folks are focused on technology transition
 27 that has a relatively predictable outcome in terms of bit supplied and as we look at bits demanded

1 which we think for DRAM next year are kind of in the mid-20s, *it doesn't appear as if there is*
 2 *going to be a significant imbalance there.*"

3 74. But, by contrast, Micron repeatedly forecast supply growing slower than demand
 4 from the end of 2016 throughout 2017. On December 7, 2016 at the Barclays Technology
 5 Conference, Micron's CFO, Ernie Maddock, forecast supply growing slower than demand: "So as
 6 we look at the supply side of the house, somewhat between 15% and 20% supply growth coming
 7 from these technology transitions and that is against a demand environment that we think is going to
 8 grow somewhere in the range of 20% to 25% on a bip basis."

9 75. On March 9, 2017, at the Susquehanna Semi, Storage, & Technology Conference, Mr.
 10 Maddock again reiterated the same forecast: "**15% to 20% bit growth in supply and 20%, 25% sort**
 11 **of intrinsic demand growth.**" And again, on August 7, 2017, Micron's CEO, Sanjay Mehrotra, at
 12 the KeyBanc Capital Markets Annual Global Technology Leadership Forum Conference reaffirmed
 13 the same gap between supply and demand and expressly noted the effect on industry fundamentals of
 14 this imbalance: "overall bit supply in the industry is in 15% to 20% range. And when you look at the
 15 bit supply growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, the
 16 demand projection, again, from all the mega markets that I earlier talked about, point to greater than
 17 20% demand for the industry. So, I do believe that for 2017 and heading into 2018 as well, the
 18 industry fundamentals will be healthy."

19 76. As described more fully below, Defendants' conduct changed at the beginning of the
 20 Class Period. Through unlawful coordination, Defendants restrained DRAM supply growth by not
 21 adding new wafers, ensuring that DRAM prices rapidly rose as DRAM demand exceeded supply.

22 **B. The Class Period Begins on June 1, 2016, as Defendants' Efforts to Coordinate to**
 23 **Ensure Capacity Discipline and DRAM Price Increases Began to Bear Fruit**

24 1. **Defendants engaged in concerted signaling to each other through public**
 25 **statements and actions in response that effectuated an agreement between**
Defendants to artificially restrict supply growth of DRAM – causing DRAM
prices to skyrocket

26 77. During the Class Period, Defendants agreed to delay or slow capacity, or not to
 27 expand capacity. This facilitated Defendants' ability to stop DRAM prices from falling and cause
 28 prices to dramatically reverse course. One method Defendants effectuated their agreement was to

1 communicate their shared intentions to limit DRAM capacity through public statements, and each
 2 taking actions in response.

3 78. Defendants made statements in earnings calls, press releases, media, or other public
 4 documents and monitored each other's plans.

5 79. Defendants' statements about capacity discipline, limiting production or supply, not
 6 increasing supply/capacity, slowing growth in capacity or supply, etc. represented a deviation from
 7 past business practices.

8 80. By reassuring each other through these communications, Defendants demonstrated
 9 each was committed to maintaining capacity and supply discipline in the midst of steady demand and
 10 rising prices – unlike in 2014, and contrary to individual interest to increase market share and short-
 11 term profits, Defendants reaped huge profits during the Class Period.

12 81. In fact, Defendants' conspiratorial conduct was tremendously effective in causing
 13 DRAM prices to skyrocket from the middle of 2016 to the end of 2017. During this period of time,
 14 DRAM spot prices rose nearly 350% – an increase totally unique compared to DRAM's prior pricing
 15 history.

16 **2. Defendants' public statements**

17 82. Defendants' public coordination efforts began at the end of 2015 and steadily
 18 increased throughout the first half of 2016. In particular, Micron made public invitations for its
 19 competitors to stop adding wafer capacity and then to cut supply. Samsung, in response, stopped its
 20 efforts to aggressively take market share through additions of wafer capacity. The actions of
 21 Defendants were effective in causing DRAM prices to first stabilize and then start to rapidly increase
 22 throughout 2016.

23 83. On November 17, 2015, Micron's CFO, Ernie Maddock, at the UBS Global
 24 Technology Conference, emphasized to investors that the DRAM industry was characterized by high
 25 market concentration with significant barriers to entry: "we do believe that from a market
 26 perspective, we're in an environment where you have closely held technology by a very limited
 27 number of producers. Micron forecast that its competitors would make some "really rational
 28 decisions" involving "lower supply growth" and no "significant DRAM capacity expansion."

1 84. Samsung responded to Micron's invitation to restrict supply growth on January 29,
 2 2016, on its fourth quarter 2015 earnings call, stating that in 2016 "we will be able to grow our
 3 supply, we're planning, at market growth levels. ***This year our main focus will be on profitability***
 4 ***rather than increasing volume.***" Samsung's 2016 plan was a change from its actions in 2015 where
 5 it had grown supply in an effort to take market share from competitors.

6 85. On March 7, 2016, Micron's CFO, Ernie Maddock, reassured investors at the
 7 Raymond James Institutional Investors Conference that Micron's competitors were now not
 8 competing for market share and were instead focused on profitability: "So the question was that there
 9 are Taiwan or Korean entities bidding for share i.e. causing our pricing environment to be different
 10 than it otherwise would be. You know, honestly we're not seeing that. . . . So obviously if you have
 11 folks look to the Koreans and if you actually look at some of the public commentary they have made
 12 with respect to the business environment they see, the focus on profitability and ***as we look at market***
 13 ***behavior it is not consistent with any sort of deliberate attempt to take share,*** but so that's what we
 14 are seeing."

15 86. On March 30, 2016, Micron's CEO, Mark Durcan, at the second quarter of 2016
 16 earnings call, in response to investor analyst questions about potential supply cuts, publicly stated
 17 that Micron would be willing to cut supply if its competitors also cut supply: "Q: Pricing is going to
 18 continue to be weak until Micron and the DRAM industry overall cuts production. So, I guess, my
 19 question is, what will it take for that to happen? A: We don't have any plans that cut production to
 20 date. ***Q: I mean is your point that it's got to come from the market share leader first?*** A: ... we
 21 ***think we'd be foolish to be the first ones to take capacity off.***" Micron's CFO further confirmed that
 22 Micron would not unilaterally cut production: "***it's a really ill-advised move to be unilaterally***
 23 ***cutting production.***" On the same call, Mr. Durcan emphasized that Micron would not try to take
 24 market share from its competitors: "***Our focus isn't on market share.*** Our focus is on making sure
 25 that we've deployed equivalent advanced technology, at least equivalent advanced technology to our
 26 competitor, so that we're not incentivizing others to play for market share." Micron's statements
 27 constituted a clear signal to Samsung and Hynix that while Micron would not unilaterally cut
 28

1 production, if either Samsung or Hynix cut production, Micron would not try to take market share in
 2 response, and that is what occurred.

3 87. Samsung, within a month, publicly responded to Micron's invitation to cut production
 4 on its April 28, 2016 quarterly earnings call, stating that its *bit growth was negative* for the quarter.
 5 Samsung confirmed to an analyst that it was constraining supply increases and would grow at the
 6 same rate as competitors: "Q: It seems you have been continuously reducing your investments on the
 7 DRAM side. Could you provide your company's outlook on the DRAM growth for this year? A: We
 8 don't expect there to be major increases in supply of DRAM in the near future ... in terms of full year
 9 2016 DRAM shipment we expect to be in line with the market growth."

10 88. On May 25, 2016, Micron's CEO, Mark Durcan, stated at the J.P. Morgan Global
 11 Technology, Media and Telecom Conference that supply growth for the next year would be around
 12 20 percent "as long as nobody adds any incremental DRAM wafers," and that "if "wafers actually
 13 come down as we're starting to hear some equipment suppliers talk about, then it could be mid- to
 14 high-teens, in which case that would be more beneficial." Micron explained that there are only three
 15 suppliers in the market, and "*we all are going to either benefit or be hurt by excess supply in the
 16 marketplace.*" Micron's CEO stated that he expected "slowing bit growth" in the industry and that
 17 he expected Micron and its competitors to maintain discipline: "there's a natural tightening tendency
 18 absent, somebody wanting to do something different than that. And so I'm – I actually remain bullish
 19 on the long term value, the DRAM business and the actions of the competitors in the marketplace."

20 89. Notably, on May 26, 2016, the World Semiconductor Council ("WSC") held its 20th
 21 Anniversary Meeting in Seoul, Korea. The meeting was attended by more than 100 CEOs and
 22 executives from global WSC members. The conference was led by Sung Wook Park (the CEO of SK
 23 Hynix and President of the KSIA). Both Micron and Samsung are members of the WSC, and their
 24 top executives may have also attended this meeting of semiconductor leaders, providing a clear
 25 opportunity for Defendants' key executives to communicate directly a few days before the Class
 26 Period began, and prices started to rise.

27 90. That same month, in May 2016, with demand remaining steady, DRAM prices began
 28 to accelerate upward rapidly.

1 91. On June 16, 2016, Micron's CFO, Ernie Maddock, reassured investors at the Nasdaq
 2 Investors Program Conference that he expected Samsung to not disrupt the industry consensus of
 3 constraining supply growth: "Q: The number of players in DRAM has gone down to three today as
 4 you mentioned, ***how concerned are you that in this new environment Samsung continues to be***
 5 ***disruptive*** A: at least thus far many of the public comments that have been made, a lot of which
 6 have been made by the equipment companies collaborate ***this idea that there is a general reduction***
 7 ***in DRAM CapEx planned by our Korean competitors and that we believe is very consistent with***
 8 ***other messages that we're hearing in the marketplace.*** So am I concerned? We're always
 9 concerned. Do we believe that that disruptive behavior is a high likelihood? It just doesn't feel as if
 10 that's the case right now."

11 92. ***From that month in June 2016, and through the end of 2016, DRAM prices***
 12 ***increased by 50 percent.*** Yet, unexpectedly absent coordination, during this timeframe each
 13 ***Defendant kept supply bit growth restrained by*** avoiding adding significant wafer capacity. At the
 14 same time, industry participants, led by Micron, began to coordinate for 2017 on a plan of keeping
 15 ***supply bit growth below forecasted demand growth.***

16 93. On a July 21, 2016 second quarter earnings call, a representative from SK Hynix's
 17 Management team stated that its bit growth for the year would be in the low to mid 20 percent range,
 18 in line with market growth. Seven days later, on July 28, 2016, Samsung stated a very similar range
 19 for bit growth in 2016 on its quarterly earnings call, and that its plans were flexible depending on
 20 market conditions.

21 94. On September 8, 2016, Micron executives at the Citi Global Technology Conference
 22 reaffirmed the industry consensus for DRAM bit growth as somewhere under 20 percent (perhaps
 23 even 15%), which they described as "good" and a "really nice environment." Micron emphasized
 24 that neither Micron nor its competitors were adding wafers that would increase available supply,
 25 with Micron's CFO reiterating public signals from Samsung and Hynix that they, like Micron, were
 26 not adding wafer capacity: "while I would love to tell you that our competitors have sent us a memo
 27 telling us what their expansion plans are, unfortunately I can't report that, but certainly we read the
 28 same thing that each of you read and it does suggest that the focus of capital spend in 2017 is going

1 to be NAND as opposed to DRAM on the part of many folks in the competitors face. And as I
 2 mentioned, *we would expect all of our bit growth to come from technology transition as opposed to*
 3 *any sort of wafer expansion.* There have been some pretty dramatic things published which I won't
 4 repeat here relative to potentially what's going on with some of our competitors and how they're
 5 choosing to use their productive capacity, *but there's no sign anywhere in the market that suggests*
 6 *there's a plan to expand DRAM wafer capacity.*" Micron's CFO strongly reassured investors that
 7 Micron had no plans to increase supply despite increasing demand: "Q: And it doesn't look like you
 8 guys are changing the supply side from Micron at all with the better demand, right? A: *Well, I mean*
 9 *we have basically announced what we intend to do in terms of bit growth and we're sticking to*
 10 *that.* And so it would have to be a very, very significant and profound belief that something had
 11 materially changed in the demand environment, I think, to cause us to reassess that CapEx plan in
 12 any significant way."

13 95. On an October 4, 2016 fourth quarter earnings call, Micron reaffirmed the industry
 14 plan of keeping supply growth between 15-20% through minimal additions of wafers – even as
 15 demand growth was forecast between 20-25%. Micron's CEO, Mark Durcan, stated that "we've
 16 seen further evidence that DRAM wafer output is declining as a result of lost throughput related to
 17 the 20-nanometer and 1X nanometer conversions. Absent some replacement of these wafers, we
 18 could see industry supply growth as low as mid-teens in 2017. *As some of lost wafer output is*
 19 *replaced, industry supply growth could be in the high-teens percent range. This compares to our*
 20 *long-term bit demand growth forecast in the low to mid 20% range.*"

21 96. On an October 27, 2016 quarterly earnings call Samsung affirmed Micron's public
 22 assessment of the market, aligning its own statements regarding supply and capacity plans in 2017
 23 with Micron: "given the fact that we haven't done much investments in DRAM this year, we are
 24 expecting our growth rates to come down, and be in line with market bit growth in DRAM next
 25 year." Samsung reassured investors that it would not try to compete with its competitors by taking
 26 market share: "Once again, as we have always mentioned, regarding DRAM, *our focus is not to*
 27 *increase our market share but to maximize our profits.* And so our investments as well as
 28 production will also be flexibly managed according to how the market unfolds."

1 97. As DRAM prices continued to rocket upward through the end 2016 and into the
 2 beginning of 2017, Defendants continued to not only make public statements about their own
 3 commitment to capacity and supply discipline, *but also the importance of maintaining capacity and*
 4 *supply discipline within the industry as a whole*, affirming their commitment to a common scheme
 5 to limit supply and capacity to drive up prices.

6 98. On November 29, 2016, Micron's CFO at the Credit Suisse Technology Media &
 7 Telecom Conference reaffirmed the commitment of the entire DRAM industry to maintaining supply
 8 growth below 20% even as demand growth exceeded 20%: "I think a lot of that confidence goes
 9 back to the fundamental view of this supply and this demand. With no way for additions, *we [think]*
 10 *that you are going to see this supply grow at something less than 20%, and even with some room*
 11 *for error on the DRAM with demand side, we still see a number there north of 20%*." Micron was
 12 confident that the "industry will do pretty well . . . until we see announcements of new wafers." Like
 13 Samsung, Micron reassured investors that it would not add supply in an attempt to compete for
 14 market share with competitors: "*our objective is to close the gap [with our competitors] and make it*
 15 *as narrow as reasonable without doing anything that would potentially be disruptive to our*
 16 *performance or the industry's performance.*"

17 99. On December 7, 2016, Micron's CFO, Ernie Maddock, explicitly stated at the
 18 Barclays Technology Conference that the absence of wafer capacity additions would allow the
 19 Defendants to easily maintain supply growth at 15-20% even as demand grew 20-25%: "we continue
 20 to look at the longer term supply demand trends and *in the absence of wafer additions by Micron or*
 21 *one of the other industry participants*, we continue to see those as healthy because the technology
 22 transitions that we're going through yield progressively fewer incremental [bit]. So *as we look at the*
 23 *supply side of the house, somewhat between 15% and 20% supply growth coming from these*
 24 *technology transitions and that is against a demand environment that we think is going to grow*
 25 *somewhere in the range of 20% to 25% on a [bit] basis.*"

26 100. On a December 21, 2016 earnings call for Micron's fourth quarter 2016 results,
 27 Micron CEO Mark Durcan reassured investors that Samsung had learned from its miscalculation in
 28 2014 of adding supply capacity to meet strong demand and pricing, which was similar to the current

1 situation facing the industry: “*Q: [Do] you have any comments on what is different between the*
 2 *previous cycle? A: Well I think that part of what happened in the last latter stages of the last cycle*
 3 *where perhaps a little bit a miscalculation by one of the suppliers, but that they probably learned*
 4 *from so there is that.*” Despite rapidly rising prices, Durcan stated that Micron “had no plans to add
 5 new wafers this year” even though it had “some clean room space” that would allow it to add wafers.
 6 Micron’s CEO also confirmed that it was closely monitoring competitors, including through the
 7 collection of ‘internal intelligence’ and expected that the industry would maintain its consensus of
 8 15-20% supply growth without significant additions of wafers: “Q: you had mentioned around 15%
 9 to 20% bit supply growth in DRAM barring any additional supply from competitors. Can you talk a
 10 little bit about the -- what you're seeing in terms of the transition to 80 nanometer for some of your
 11 competitors? And *is there risk in your mind in terms of additional supply coming online, any*
 12 *thoughts on that would be helpful.* A: We don't have great crystal ball as to where our competitors
 13 are doing. *We read the same reports that you guys read. All of that plus all the other internal*
 14 *intelligence we can generate that baked into our ranges and in the data sheet that we provided. So*
 15 *I think there has been some chatter recently potentially about few incremental wafers from one of*
 16 *the suppliers. Our view of that is if that were to happen, it's a relatively minor adjustment in terms*
 17 *of the overall scope of the bit growth that we're projecting and it would probably not cause us to*
 18 *change that range that we've giving you.”*

19 101. On January 10, 2017, at the Needham Growth Conference, Micron’s CFO, Ernie
 20 Maddock, further signaled Micron’s confidence that Samsung would not deviate from the industry
 21 consensus of restricting supply to ensure it grew slower than demand growth: “Q: Can you talk about
 22 [Samsung] and how rational...? A:...I think their comments need to stand on their own and *their*
 23 *comment seems to suggest a rational approach to addressing the supply/demand constraints of the*
 24 *DRAM market...*the world is very different today than it was a few years ago...” Maddock again
 25 reiterated the shared plan of the industry to maintain 15-20% supply growth even as demand grew
 26 between 20-25%: “Our review of the DRAM business is *that there will be somewhere between 15%*
 27 *and 20% bit supply from Micron and all the other participants in the industry...we think demand is*
 28 *going to be...somewhere between 20% and 25%.*

1 102. On January 24, 2017, Samsung reassured investors on its quarterly earnings call that it
 2 had no plans to add wafer capacity and would continue to constrain increases in DRAM supply
 3 despite rapidly rising prices: “Q: *I'm a little bit surprised that Samsung is not looking to be a little*
 4 *bit more aggressive towards the capacity additions ...If demand continues to be so strong and*
 5 *supply/demand balance remaining tight, is there some possibility that Samsung can actually boost*
 6 *capacity through the year and potentially beat those numbers, just like you did in 2016? A: And*
 7 *looking at the current market situation, we believe that we are able to cover the current market*
 8 *demand through our technology migration. So that is why we will be maintaining our operation*
 9 *flexibly and try to cover the market demand within our technology migration. So, given the size as*
 10 *well as the lead time necessary for increase of DRAM capacity, we believe that temporary increase*
 11 *of DRAM supply is not very easy.”*

12 103. On January 25, 2017, SK Hynix publicly matched the stated plans of its competitors –
 13 keeping supply growth below demand growth while not trying to take market share. Specifically, SK
 14 Hynix executives stated that the company “believe[s] that throughout the first half of the year supply
 15 is not going to meet the demand which remains very strong” and that “the company is planning for a
 16 DRAM bit shipment growth that is on par with the market for this year.” This course of action
 17 would allow SK Hynix to “maximize profitability.”

18 104. Industry analysts from Sanford Bernstein noted the refusal of the Defendant-
 19 competitors to increase supply, with multiple analyst reports on SK Hynix in January 2017
 20 identifying, for example, that there is “tighter than expected supply/demand balance for the quarter,”
 21 and that given this “we expect this strong pricing environment (especially in DRAM) through mid-
 22 2017 at least, as inventory levels are low and supply growth remains relatively muted in both DRAM
 23 and NAND. . . . With all players growing bits relatively modestly, we don’t see any pricing
 24 collapse.” Goldman Sachs also forecast on January 30, 2017 that DRAM pricing would “increase
 25 further in 1H17, driven by a tight supply/demand balance” and that Goldman believed that “the
 26 leading DRAM maker, Samsung Electronics (SEC) [would] not become aggressive to gain market
 27 share in 2017 given that: (1) SEC’s management is likely to focus more on profitability rather than
 28 market share in DRAM due to structural margin pressure on its smartphone business.”

1 105. As prices and margins continued to accelerate among Defendants upward, Micron's
 2 CFO strongly reiterated on March 9, 2017 at a Susquehanna Semi, Storage & Technology
 3 Conference Call, that Micron had no "plan to add [DRAM] wafers in any form" and would not be
 4 attempting to increase its market share. Micron also stated that its competitors were in agreement
 5 that they would not add capacity in an effort to take market share from each other: "But at the end of
 6 the day, it has typically not been Micron who has expanded industry capacity when the margin
 7 profile upgrade... *all of the statements and all of the actions thus far suggest the things may indeed*
 8 *different in terms of how the participants are thinking about, the balance of profitability versus*
 9 *market share.*" Micron also stated that it would "provide maximum benefit to the Company" to be
 10 "public about the fact that we have no current plan to add wafer capacity."

11 106. On March 23, 2017, Micron's CEO, Mark Durcan, reiterated on the second quarter
 12 2017 earnings call that Micron and its competitors, in contrast to previous cycles, were continuing to
 13 constrain supply growth in the face of healthy demand: "We also see that the supply, as best we can
 14 tell, seems in control relative to demand. And I think, if you think about this cycle versus last cycle,
 15 what you saw -- what you saw last cycle was a big chunk of supply come off with the Hynix fire and
 16 the reaction with more supply to replace it and so maybe a little less stability than we're seeing this
 17 time around." Durcan also reassured investors that Samsung's behavior had changed from previous
 18 cycles and that there was no reason for Samsung to lower the industry's profitability by adding wafer
 19 capacity: "*Q: ... People are obviously worried about Samsung adding a bunch of wafers. Why*
 20 *would that not happen this time? ... But what's your base assumption for what the competition will*
 21 *do sort of in terms of bit growth this year?* A: Again, I think the last cycle was a little different with
 22 that instability in supply created by the Hynix fire. *I don't know why they would intentionally*
 23 *repeat the mistake from last cycle. They probably are enjoying making good margins...* Samsung
 24 is actually probably on the low end over the next couple of years relative to what's going on in the
 25 industry as a whole. And the industry as a whole is probably a little bit south of where we think
 26 demand growth is."

27 107. On March 23, 2017, Micron also reiterated an industry-wide forecast of bit supply
 28 growth between 15-20% and demand growth between 20-25%: "It's still, in our view, it's 15% to

1 20% supply growth this year, could actually be less than that if there's less new wafers than we have
 2 in our plan. Demand is still 20% plus." An investment analyst asked if Micron would add wafer
 3 capacity because of "such strong pricing out there in the market." Micron's CEO, Mark Durcan,
 4 responded that it indeed had the space to add wafer capacity in its manufacturing centers in the face
 5 of strong demand but still insisted that Micron would not add supply – maintaining the industry
 6 consensus: "**We're not focused on adding more supply...We do have white space in both our Fab**
 7 **16 in Taichung as well as Fab 10X, but we're not planning any capacity additions this year.**"

8 108. On April 25, 2017, an investment analyst specifically asked SK Hynix on its first
 9 quarter 2017 earnings call if it had plans to expand its supply growth above the 20% rate that
 10 matched the supply growth range of Micron and Samsung. SK Hynix acknowledged its capacity to
 11 potentially grow supply faster but said its current projection of 20% growth remained its plan for
 12 2017: "Q: I believe you're saying in line with the market about 20%... is there any possibility [for
 13 DRAM bit growth] to go higher than that 20% mark...?A: the current projection for about 20% level
 14 growth is also based on the assessment of ... all of the factors"

15 109. On April 27, 2017, Samsung again forecast on its quarterly earnings call that for 2017
 16 "we expect DRAM market bit growth to be high-teens and we expect to grow in line with the
 17 market." Samsung also reaffirmed that it would not add wafer capacity in the face of investor
 18 questions about its plans, stating that "**we have no plans of additional capacity.**" Samsung did note
 19 that it could change its DRAM capacity "depending on the market situation that unfolds."

20 110. On May 24, 2017, Micron's CFO, Ernie Maddock, reassured industry analysts at the
 21 JP Morgan Global Internet, Media and Technology Brokers Conference that Micron and its
 22 competitors – unlike previous years – were being careful not to add supply: "if you listen to the
 23 commentary coming from industry participants on the supply side it reflects a great deal of discipline
 24 and thoughtfulness with respect to how the industry participants are considering supply expansion...
 25 Although we don't speak for the industry, the other participants have spoken and indicated a great
 26 deal of discipline."

27 111. At the same event, Micron made announcements on supply growth that matched those
 28 of its competitors the previous month and affirmed the industry consensus of growing supply 15-

1 20%: “*on the DRAM side you're going to see somewhere between 15% and 20% growth in bits supplied, that's something that the other suppliers in the market are also saying, within reasonable range.*”⁶ Micron emphasized that its plans to not add wafer capacity in 2017 were consistent with
 2 that of Samsung and SK Hynix and would allow each participant to maintain supply growth between
 3 15-20%: “Q: their view was, exiting this year, industry capacity is probably flat. And I don't know if
 4 you have a view on total industry capacity dynamics, and your sense of where that could be exiting
 5 this year? A: I think that's reasonably consistent with certainly what we've said about our intent,
 6 and then certainly the public comments of the other industry participants have been pretty much
 7 exactly that. That while you do get some wafer loss as a result of technology transitions, the intent
 8 that we have is to maintain flat wafer outs, so essentially you are adding a little bit of capacity to
 9 make up for those lost wafer outs, but as an industry as a whole, you are not adding substantial
 10 incremental industry wafers and that would contribute to or allow you to get into this 15% to 20%
 11 range in terms of bit growth.”

12. On June 6, 2017, Micron’s CFO, Ernie Maddock, yet again reiterated at the Bank of America Merrill Lynch Global Technology Conference that the industry was systematically keeping supply growth constrained at 15-20% even as DRAM demand grew 20-25% on a yearly basis: “So, on DRAM, we have been saying for some time that we thought that from a demand perspective, that demand was going to be somewhere in the range of 20% to 25% year-on-year bit growth. And in fact, we feel that’s a reasonable estimate to use for the next few years at least out as far as we would think about and model the business. And then from a supply side, we think that even with some very modest wafer additions by the industry essentially keeping wafer output flat in the face of declining bits coming simply from technology transition that aggregate bit growth from a supply point of view is going to be somewhere in the range of 15% to 20%.” Maddock emphasized that the three industry participants who controlled the market could maintain this supply shortfall if they remained disciplined about not adding supply: “it feels as very much as if you’ll have good balance between supply and demand as long as capital discipline is exercised. And *certainly Micron has indicated*

6 Micron Technology's (MU) Management Presents at JP Morgan Global Internet, Media and Technology Brokers Conference.

1 *the difference to be reasonably disciplined with its capital investments, and other industry*
 2 *competitors in their particular public disclosure have said similar things.*" Micron's comments in
 3 response to questions explicitly suggested interdependent action where each of the three DRAM
 4 suppliers agreed not to add supply capacity despite rapidly increasing DRAM prices: "Q: Maybe
 5 another way looking at the overall of the DRAM industry today's margins very high, so that could be
 6 sort of the temptation for your competitors because this is borrowing cost very low, right...don't you
 7 expect any competitors tend to irrationally backing on the better, cyclical momentum? A: **I can say**
 8 **our view of industry bit demand will have to be materially different than in the peers to be today to**
 9 **begin to have a think about expanding capacity** well beyond where we are thinking today which is
 10 predominantly to get that capacity through technology transition... **I don't think our view of how we**
 11 **look at the industry is very-very different then how other rational smart people sitting and other**
 12 **competitors tend to look at the industry.**"

13 113. On June 8, 2017, Micron's CFO, Ernie Maddock, again reaffirmed at the Robert W.
 14 Baird Global, Consumer, Technology that each of the three DRAM manufacturers were refusing to
 15 add wafer capacity in the face of rapidly rising DRAM prices: "[T]here has actually been much more
 16 disciplined behavior on the part of the remaining industry participants, of which there are now only
 17 3, it's Micron, Samsung and Hynix. And so while each of us is assessing the market, looking at the
 18 market, **I think there's great consistency between suppliers relative to our view of market growth**
 19 **opportunities on the demand side. And what you see being exercised today is disciplined**
 20 **investment around expansion of capacity relative to expansion of demand.** And each one of us has
 21 made our own independent comments on what we think makes sense for our particular company. In
 22 Micron's case, we said that we have no plans for additional new wafer fab capacity that we will get
 23 the bits that we require to serve the market from technology transitions."

24 114. Throughout this quarter, DRAM prices continued to rapidly rise. Yet, the supply
 25 discipline remained strong as each of the Defendants kept supply growth below demand growth, only
 26 further fueling the price increases. The competitors also **publicly reassured each other that they**
 27 **would avoid competing against each other for market share.**

1 115. On June 29, 2017, Micron on its third quarter 2017 earnings call reaffirmed that the
 2 total DRAM industry bit growth “**would be between 15-20%... below our view of demand growth**”
 3 despite rapidly rising DRAM prices. Micron then strongly reiterated that it had no plans to add
 4 wafer capacity. Micron’s investors even questioned Micron’s CFO closely on whether its plans to
 5 limit supply growth would not cause a loss of market share that led to profit loss: “Q: Could you help
 6 us just kind of frame, is there enough sort of mix up opportunity during the first half ‘18 where even
 7 though you might be losing some bit share, you might not be losing sort of profit share in the
 8 industry? A: ... we talked about our bit growth in context of an industry that we were estimating. But
 9 we also used the words at or slightly below, not materially below.”

10 116. On July 25, 2017, Hynix told investors on its second quarter 2017 earnings call that
 11 its DRAM shipment growth for the year would be “at low 20%, on par with the market.”

12 117. Samsung, two days later on July 27, 2017, stated that it too was forecasting its bit
 13 growth to be in the high teens, and that Samsung expected “our bit growth to be in line with the
 14 market.” Samsung reassured investors that it would not disrupt the industry by adding DRAM
 15 capacity in an attempt to fight for market share: “Next year, we are considering possibly converting
 16 some of the NAND capacity to DRAM, but the actual timing or size of that will depend on the
 17 market situation that unfolds next year. **As we have always emphasized in the conference calls, we**
 18 **will refrain from, for example, increasing market share, fighting on volume.** We manage our
 19 business with a profitability focus. And so, we will flexibly manage our capacity by very closely
 20 monitoring the market situation, as well as the supply and demand balance.” Samsung’s statements
 21 represent a change in behavior from its prior practice in 2014-2015 of competitively adding supply in
 22 an attempt to take market share from competitors.

23 118. Micron’s CEO, Sanjay Mehrotra, within two weeks of the public comments of
 24 Samsung and Micron, confirmed on August 7, 2017, at the KeyBanc Capital Markets Annual Global
 25 Technology Leadership Forum Conference that each of the three competitors were taking the same,
 26 interdependent approach to bit supply growth – maintaining it below 20% even as demand growth
 27 exceeded 20%: “Q: Have you -- either of you’ve seen any changes in the market with respect to
 28 recent commentary and related to what Samsung or Hynix said on the earnings calls in terms of bit

1 supply that would be of any concern or CapEx plans that would be of any concern? A: ***I think***
 2 ***overall bit supply in the industry is in 15% to 20% range.*** And when you look at the bit supply
 3 growth perhaps, may be little bit toward the higher end of that 15% to 20% range. But, ***the demand***
 4 ***projection, again, from all the mega markets that I earlier talked about, point to greater than 20%***
 5 ***demand for the industry.*** So, I do believe that for 2017 and heading into 2018 as well, the industry
 6 fundamentals will be healthy.” Micron’s CEO also emphasized that Micron, Samsung, and Hynix
 7 controlled 95% of the DRAM market: “95% of the industry is supplied by three players, and Micron
 8 has a solid position in the DRAM industry. So, that’s a great position to be in.”

9 119. On September 6, 2017, Micron’s CFO, Ernie Maddock, reassured investors at the Citi
 10 Global Technology Conference, that industry consolidation over the last several years allowed
 11 Micron and its competitors to exercise mutual discipline over supply growth: “I do think
 12 ***consolidation has been very instrumental in having a disciplined and orderly expansion of supply.***
 13 We have certainly seen that now over period of a couple of years and we expect based on everything
 14 that we can see that you’re going to continue to have a disciplined expansion of supply as we look
 15 forward into fiscal '18 for Micron.” Maddock emphasized a shared, publicly stated desire among
 16 Micron, Samsung, and Hynix to keep wafer capacity flat: “***if you listen to the public commentary of***
 17 ***the industry participants, the key message across the Board is that the investments are mainly for***
 18 ***technology transition with the desire to keep wafer starts roughly flat.***” Maddock was clear that
 19 keeping wafer capacity flat would allow Micron, Samsung, and Hynix to keep supply growth below
 20 demand growth: “this will allow the industry to ***grow bits at this 20% plus or minus range*** over the
 21 course of any given year and certainly that feels very well matched to what we believe the demand to
 22 grow from a supply point of view, which is in the 20% to 25% range.”

23 120. On September 27, 2017, Micron reassured investors on the fourth quarter 2017
 24 earnings call that it expected the “industry to remain moderately undersupplied for the rest of 2017
 25 for ... DRAM.” Micron’s CFO, Ernie Maddock, told investors that it would not grow its supply
 26 capacity faster than that of industry participants and thus would maintain the industry consensus: “Q:
 27 [A]t what point, do you think you begin to start to outgrow bits relative to the industry for [DRAM]?
 28 A: I would also tell you that our objective over a multiyear period is to grow at about industry

1 levels... *really important is the segment that we intend to grow aligned with industry* over the
 2 course of these multiyear periods.” Despite undersupply in the DRAM market, Micron stated that it
 3 intended for its DRAM bit growth for 2018 to “be slightly below the industry growth rate.”

4 121. SK Hynix, less than a month later on October 16, 2017, also told investors on its
 5 quarterly earnings call that the DRAM market was in a state of undersupply and that SK Hynix
 6 would not be able to quickly ramp up wafer capacity to satisfy this undersupply in the market. SK
 7 Hynix also told investors that it intended to grow its DRAM capacity in 2018 in line with the market.

8 122. Samsung, on October 31, 2017, told investors on its quarterly earnings call that it was
 9 actually adding less DRAM capacity than previously planned despite rapidly rising prices because
 10 “our basic approach to DRAM capacity management is that we will flexibly manage our capacity
 11 especially depending on the market situation for each product.” Samsung emphasized that for the
 12 year Samsung’s DRAM bit growth for the year had been below the industry, stating that “2017
 13 market DRAM bit growth [will] be approximately 20% and our bit growth will be mid-teens.”

14 123. Throughout this period, Samsung had the highest market share in the DRAM industry.
 15 Richard Posner recognized that “declining market shares of leaders” is a plus factor potentially
 16 indicative of cartel conduct.⁷ Samsung acknowledged on October 31, 2017 that it had lost market
 17 share that year but stated that it would not seek to regain market share by growing supply more
 18 rapidly than the market: “Q: this is the first time that Samsung Electronics has lost market share in
 19 DRAM? Does it plan to regain its previous market share next year or will you be more trying to
 20 maintain where you stand currently? A: It's a bit too early for us to give you specifics about what we
 21 plan to do with DRAM, but the current guidance that we can give you is that for next year, our bit
 22 growth for DRAM is expected to be at market growth levels.

23 124. Through the end of 2016, DRAM prices began to rapidly increase. By February
 24 2017, DRAM spot prices had nearly doubled since their low in the spring of 2016. Throughout this
 25 period, Micron assured investors that Samsung and the other Defendants would not repeat the actions

27
 28 ⁷ See Richard A. Posner, Antitrust Law, 79-93 (2d Ed. 2001).

1 from the previous years, particularly in 2014, and add significant new DRAM capacity in the face of
 2 steady demand and rising prices.

3 **3. Throughout 2017, Defendants repeatedly reassured each other that, unlike in
 previous periods, each would not respond to rising prices and strong demand
 with increased supply growth. Instead, the Defendants would stick with their
 publicly announced plans to keep supply growth below demand growth by not
 adding wafer capacity and not seeking to take market share from each other.**

6 125. On March 9, 2017, Micron’s CFO, Ernie Maddock, told investors at the Susquehanna
 7 Semi, Storage & Technology Conference, that that Micron had no “plan to add [DRAM] wafers in
 8 any form” and would not be attempting to increase its market share and that it would “provide
 9 maximum benefit” to Micron to be “public about the fact that we have no current plan to add wafer
 10 capacity.” Maddock alleged that its competitors shared the same approach of not growing supply in
 11 an effort to take market share, stating ***“all of the statements and all of the actions thus far suggest
 the things may indeed different in terms of how the participants are thinking about, the balance of
 profitability versus market share.”***

14 126. Throughout most of 2017, Defendants strongly assured investors that each of the
 15 Defendants was taking the same shared approach. For example, on June 8, 2017, with DRAM prices
 16 having risen 20% in the last month, Micron’s CFO told investors at the Robert W. Baird Global
 17 Consumer, Technology & Services Conference that “[T]here has actually been much more
 18 ***disciplined*** behavior on the part of the remaining industry participants, of which there are now only
 19 3, it’s Micron, Samsung and Hynix. And so while each of us is assessing the market, looking at the
 20 market, I think ***there’s great consistency between suppliers*** relative to our view of market growth
 21 opportunities on the demand side. And what you see being exercised today is ***disciplined investment
 around expansion of capacity relative to expansion of demand.***” And on July 27, 2017, Samsung
 22 assured investors on its quarterly earnings call that it would not try to take market share from its
 23 competitors: ***“As we have always emphasized in the conference calls, we will refrain from, for
 example, increasing market share, fighting on volume.”***

26 127. Even as DRAM prices continued to rise throughout 2017, the Defendants stuck to
 27 their common plan of not adding wafer capacity even though each had space to add such supply to
 28 meet the strong demand. For example, on September 6, 2017, Micron’s CFO, Ernie Maddock, at the

1 Citi Global Technology Conference, emphasized a shared, publicly stated desire among Micron,
 2 Samsung, and Hynix to keep wafer capacity flat: “*if you listen to the public commentary of the*
 3 *industry participants, the key message across the Board is that the investments are mainly for*
 4 *technology transition with the desire to keep wafer starts roughly flat.*”

5 128. Micron’s CEO, Sanjay Mehrotra, reaffirmed on November 28, 2017 at the Credit
 6 Suisse Annual Technology, Media & Telecom Conference that the industry-wide approach of not
 7 adding significant wafer capacity and keeping supply growth below demand growth: “For fiscal year
 8 ’18, what we have said is, industry supply that growth 20% ... while the demand trends I believe will
 9 continue to be somewhat stronger than that”...“there may be some wafer capacity additions [in the
 10 industry] but they will remain relatively small.”

11 129. Micron’s CFO confirmed on December 6, 2017 at the Nasdaq Investor Conference
 12 that the industry planned to keep wafer capacity flat for several years despite rapidly rising DRAM
 13 prices: “We are not adding wafers for either technology in 2017. I think if you look at the public
 14 comments of other suppliers they are adding marginal numbers of wafers. But *essentially if you*
 15 *look at the industry in aggregate even at the end of 2018 it's altogether possible for DRAM that the*
 16 *number of wafers the industry produces is the same or slightly less than it was some years ago.*”
 17 Micron’s CFO flatly stated that Micron and its competitors shared a common agreement to constrain
 18 DRAM supply: “*if you look at the public commentary of all the industry participants...I think there*
 19 *is a general belief that the industry participants are keenly aware of the fact that the DRAM*
 20 *market is relatively inelastic and the way you serve that market is by making sure there is*
 21 *adequate, but not excess supply.*”

22 **C. End of Conspiracy: Once Chinese Investigation was Announced, Defendants’ Conduct**
23 Changed Abruptly

24 130. DRAM prices continued to climb, and then abruptly stopped in early 2018, just after
 25 China’s antitrust regulator, the NDRC, announced that it had begun an investigation into the DRAM
 26 industry due to the noticeable and sharp rise in the price of DRAM over the 18-month period from
 27 June 2016 to December 2017.
 28

1 131. On December 27, 2017, a Reuters article reported that China's NDRC was
2 investigating possible price-fixing in the DRAM market. Reuters reported that the investigation was
3 looking into possible coordinated action taken by "a number of firms to gain maximum profits by
4 pushing the price of the product as high as possible. A 'super cycle' of tight supply and soaring
5 demand for memory chips, which power servers and smartphones, has been driving up prices and
6 profits at chipmakers such as Samsung Electronics Co., Ltd. And SK Hynix, Inc. which control the
7 lion's share of the global market."

8 132. As Xu Xinyu, an official with the Pricing Supervision Department of China's NDRC
9 put it: "We have noticed the price surge and will pay more attention to future problems that may be
10 caused by 'price fixing' in the sector." Xu Xinyu referred to "coordinated action taken by a number
11 of companies, pushing the price of the product as high as possible to gain maximum profits."

12 133. On February 1, 2018, it was reported that the NDRC and Samsung signed a
13 Memorandum of Understanding that would result in moderations to the price increases of DRAM in
14 2018.

15 134. In April 2018, Hynix publicly announced that it was adding wafer capacity by 6-7%
16 per year in order to meet demand growth. This addition of wafer capacity was a change in practice
17 from the Class Period where the Defendants artificially constrained the growth of wafer capacity in
18 order to inflate the price of DRAM.

19 135. Defendants' illegal behavior, alleged herein, artificially stabilized and raised the
20 prices of DRAM during the Class Period. As a result, DRAM prices were higher than they would
21 have been absent the conspiracy. The rise in DRAM prices, however, cannot be legitimately
22 explained away by the economics of the market. Leading up to and during the Class Period, costs
23 remained low or stable and there were not technological or other impactful events, such as
24 unexpected growth in demand, that would explain the extraordinarily high prices for DRAM during
25 that time.

VI. THE STRUCTURE OF THE DRAM INDUSTRY IS CONDUCIVE TO CONSPIRACY

136. The structure and characteristics of the DRAM market are conducive to cartel behavior, and have made collusion particularly attractive in this market. The DRAM market has all of the hallmark features that are found in highly-cartelized markets, including: (1) DRAM is a commodity product; (2) the DRAM market is highly concentrated; (3) the DRAM market has high barriers to entry; (4) demand for DRAM is inelastic; and (5) the DRAM market experienced steep price increases during the Class Period, without any legitimate economic reason for those increases, such as increasing costs. There was also an ease of information sharing amongst Defendants through the industry reporting mechanism DRAMeXchange, as well as opportunities for Defendants to directly communicate and collude through common participation and leadership roles in trade associations and other industry groups.

A. DRAM is a Commodity Product

137. In economics, a commodity is a basic item or good used in commerce that is interchangeable with other goods of the same type. Commodities are most often used as inputs in the production of other goods or services. Examples of traditional commodities are sugar, wheat, and rubber. As technologies for markets and goods mature, a product is more likely to be considered a commodity, at least in its more basic implementations.

138. DRAM is a commodity. DRAM has been described as “like milk or bread,” and that it “varies little from manufacturer to manufacturer.”

139. Markets for commodity products are conducive to collusion. Typically, when a product is characterized as a commodity, competition is based principally on price, as opposed to other attributes such as product quality or customer service. This factor facilitates coordination because firms wishing to form a cartel can more easily monitor and detect defections from a price-fixing agreement where any observed differences in prices are more likely to reflect cheating on the conspiracy than any other factor which might affect pricing, such as special product characteristics, service or other aspects of the transaction.

1 140. The commodity nature of DRAM is aided by industry-standard product specifications.
 2 The different sizes and classifications of DRAM are well known and easily quantifiable. Therefore,
 3 DRAM can be purchased and sold in large volume quantities by manufacturers and distributors
 4 based on common size and technology characteristics. Indeed, manufacturers and distributors
 5 maintain very detailed product catalogs and substitution guides (sometimes called cross-reference
 6 guides) that outline rules for swapping out DRAM made by other Defendants based on their common
 7 characteristics.

8 **B. The DRAM Market is Highly Concentrated**

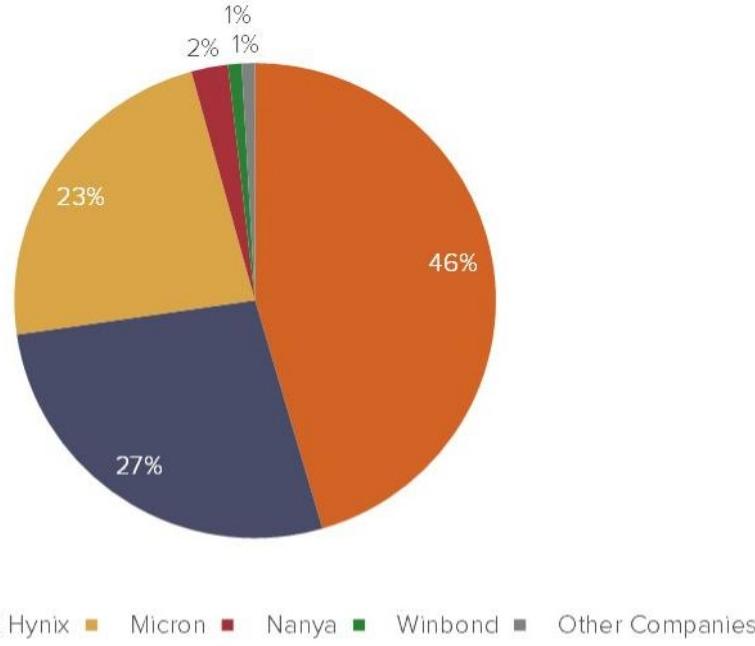
9 141. Market concentration facilitates collusion. Collusive agreements are easier to
 10 implement and sustain when there are only a few firms controlling a large portion of the market.
 11 Practical matters, such as coordinating cartel meetings and exchanging information, are much
 12 simpler with a small number of players. Moreover, this high degree of control also simplifies
 13 coordination because there is little outside competitive presence to undermine the cartel, and it is
 14 easier for cartel participants to monitor each other's actions related to supply and pricing. Also, with
 15 fewer firms in the market, the bump in transitory profits that could be achieved by undercutting the
 16 cartel price and gaining an increase in transitory market share would be outweighed by the greater
 17 long-term market share for a colluding firm in a concentrated industry.

18 142. By contrast, if an industry is divided into a large number of small firms, the current
 19 gain from cheating on a cartel (profits from sales captured from other cartel members through
 20 undercutting of the cartel-fixed price in the current time period, which risks causing the cartel to fall
 21 apart in the future) is large relative to the firm's possible gains from the cartel's continuing future
 22 success (the firm's future share of the total cartel profits if collusion were to continue successfully).

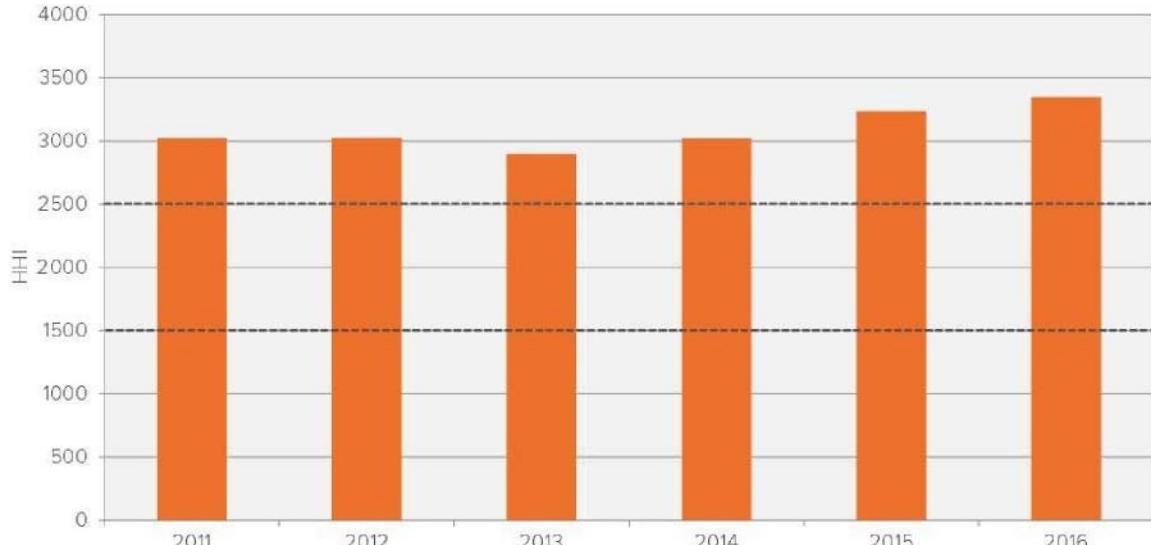
23 143. In the 1980s there were over 20 DRAM manufacturers. By 2012, that number had
 24 dropped to fewer than 11 manufacturers. Several factors, such as weak demand for consumer
 25 electronic products due to the great financial crisis during 2008 to 2012, as well as natural disasters,
 26 curtailed supply of hard disk drives and, as a result, caused a slowdown in the memory market, and
 27 caused DRAM makers to either go out of business or to be acquired by other companies.

144. The DRAM market is highly concentrated. As of March 2018, the DRAM market was dominated by *only three main players* – Defendants Micron, Samsung, and SK Hynix. These companies collectively control the lion’s share of these markets, and have existed in the market together for years.

145. As of March 2018, Defendants collectively accounted for 96% of worldwide DRAM market share. Samsung held 46% of worldwide DRAM market share. SK Hynix held 27% of worldwide DRAM market share. Micron held 23% of worldwide DRAM market share. A handful of other manufacturers made up the other 4% of worldwide market share.



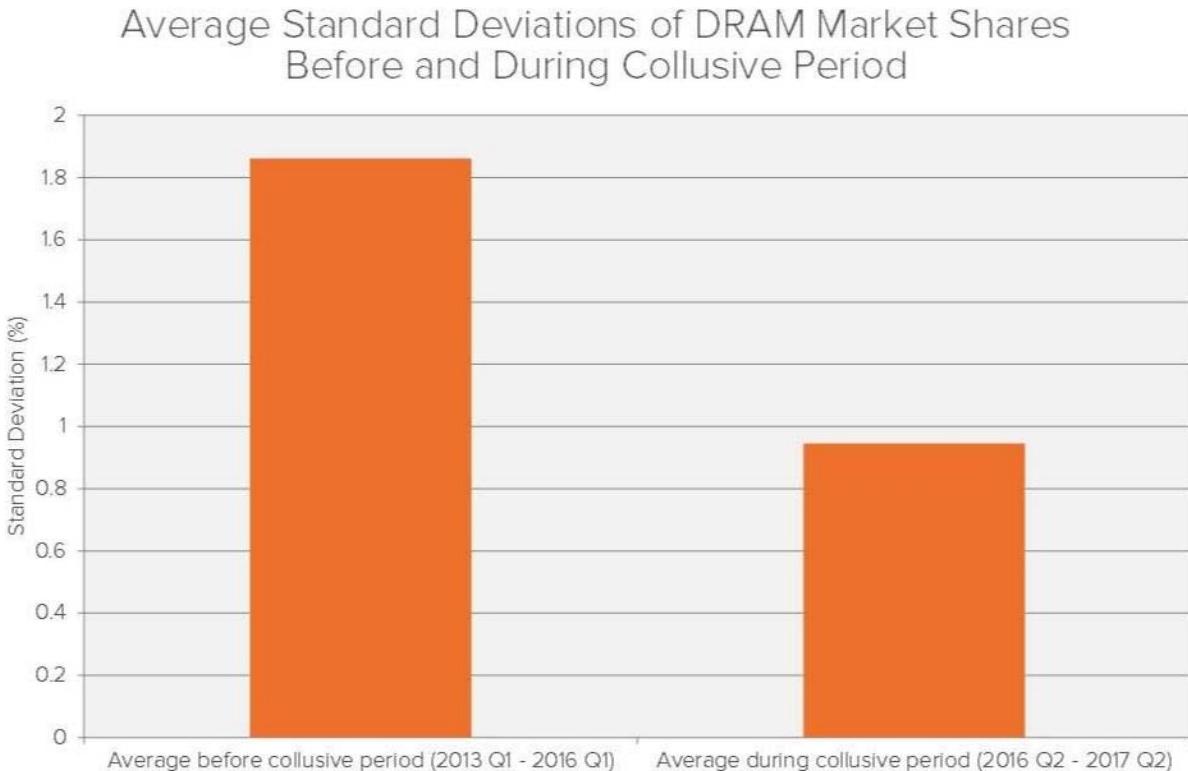
146. The Herfindahl-Hirschman index (HHI) is a commonly accepted measure of market concentration. The DOJ considers markets in between 1,500 to 2,500 to be moderately concentrated whereas anything in excess of 2,500 points is considered highly concentrated. The DRAM market HHI has been increasing over time as a result of industry consolidation and, by 2016, was 3,300.



Source: Bloomberg.

147. A highly concentrated market makes it easier for Defendants to facilitate their
 148. conspiracy by making it easier to make agreements, form understandings, combinations or
 149. conspiracies to fix, raise, maintain, and/or stabilize prices, and/or to allocate market shares, and to set
 150. and keep prices at artificially high, supra-competitive levels. In fact, throughout the Class Period,
 151. Defendants collectively maintained high market shares, and prices for DRAM remained
 152. astonishingly high.

153. In addition, in a competitive market, market shares are expected to fluctuate as
 154. manufacturers compete and win customer business from one another. During the alleged Class
 155. Period, DRAM market shares were flatter than they had been in the previous period. Specifically,
 156. the average variation in the market shares decreased from almost 2%, prior to the Class Period, to
 157. less than 1% before and after Q2 2016, as shown in the chart below.



Source: Bloomberg.

C. The DRAM Market Has High Barriers to Entry

149. Barriers to entry are obstacles which prevent new competitors from easily entering the market. They restrict competition in a market and may make it easier for incumbents to collude.

150. A collusive arrangement that raises product prices above competitive levels would, under basic economic principles, attract new entrants seeking to benefit from the supra-competitive pricing. Where, however, there are significant barriers to entry, new entrants are less likely to enter the market. Thus, barriers to entry help to facilitate the formation and maintenance of a cartel.

151. There are substantial barriers to entry that preclude, reduce, or make it more difficult for new entrants into the DRAM market. As one market observer lamented, “DRAM development requires huge investment and poses risk,” and it is hard for new entrants to enter the market.

1. Defendants own the intellectual property for DRAM through cross-licenses, patents, and joint ventures

152. The DRAM industry is also marked by a number of patents and partnerships between incumbents. A significant number of patents are cross-licensed among Defendants. Partnerships and

1 alliances for technology and capacity further increase Defendants' market power and make it harder
 2 for a new entrant to enter the market.

3 153. Defendants own the patents for DRAM and enter into cross-license agreements with
 4 each other. In 2010, Micron signed a ten-year cross-license agreement with Samsung. Following
 5 this, in July 2013, Samsung and SK Hynix signed a cross-licensing contract according to which the
 6 companies share several chip-related patents.

7 154. Defendants repeatedly recognized the importance of holding the intellectual property
 8 rights as a way to fend off new entrants. For example, Micron's CFO noted at a June 5, 2017
 9 conference that the Defendants controlled important intellectual property and would not license it to
 10 potential Chinese entrants: the "real challenge is there is no source of IP other than the existing
 11 industry participants. And those industry participants I think are appropriately thoughtful about
 12 whether or not they want to license or otherwise share that IP with a potential new industry entrant.
 13 And in the absence of that IP I think, that the opportunity for China to successfully enter is
 14 significantly hampered."

15 155. At a separate conference on June 15, 2017, Micron's CFO indicated that none of the
 16 Defendants would license their IP to a new entrant who would think differently about capacity than
 17 the Defendants: "if you look at every entrant into the memory business at some point in time, they
 18 had a legitimately sourced core of IP that allowed them to form the capability around which they
 19 have advanced their technology...[and] ***the only IF holders in DRAM are the three industry***
 20 ***participants and in various forms and flavors we have all indicated that we would be very***
 21 ***challenged to think about transitioning that IF to someone*** who might think about industry
 22 capacity" in an expansionary way.

23 156. Industry analysts have also commented on the threat of the Chinese entering the
 24 DRAM market, and have noted that even if the Chinese were able to develop advanced technology
 25 necessary to rival the Defendants on their own, the new Chinese suppliers would infringe on the
 26 numerous patents for DRAM that are held by Samsung, SK Hynix, and Micron (or other DRAM
 27 manufacturers).

1 157. In 2017, Avril Wu, DRAMeXchange’s Research Director, commented that it was
 2 considerably difficult for Chinese startups to adopt the project design of DRAM, and without joint
 3 ventures or partnerships, it would be difficult for any Chinese new entrants to make a move on
 4 DRAM legally.

5 158. In 2017, President Lee Pei-ing of Nanya Technology (“Nanya”), a smaller DRAM
 6 manufacturer, commented that it would take around three to five years for China to pose a threat to
 7 the existing memory industry.

8 **2. DRAM manufacturers have the benefit of economies of scale**

9 159. Economies of scale are cost advantages that arise due to scale of operation, with cost
 10 per unit of output decreasing with increasing scale of production. DRAM manufacturers have
 11 exhibited strong economies of scale through the following ways:

- 12 • Technical Economies: These are cost savings that arise from increased use of
 large scale and specialist machinery, with strong technical capabilities. These
 requirements have created high barriers to entry in the DRAM market for the past
 20 years. Manufacturers are under constant pressure of decreasing process node
 size in order to meet increasing demand of memory density, and thereby reducing
 cost per bit of DRAM produced. From 2000 to 2016, manufacturers of DRAM
 have decreased the node size from 130 nm to 20 nm. Through this transition,
 existing market players have built years of capability, enough to sustain
 development costs that are increasing by 13% annually. New entrants do not have
 the benefit of this integration.
- 13 • In addition: Defendants are vertically integrated firms – meaning that they
 participate in various levels of the supply chain. For example, Defendants not
 only make DRAM, but they produce various DRAM Products in house (such as
 smartphones and tablets, etc.). By procuring their own materials, Defendants
 enjoy a cost advantage over potential new entrants who may not have such
 vertical integration arrangements.

14 160. The scale and technological requirements of producing DRAM memory products
 15 explain why there are so few players in the market, and how these aspects put potential entrants at a
 16 cost disadvantage. Between 2001 to date, no serious new DRAM competitors have emerged.

17 161. Micron CEO, Sanjay Mehtotra, stated that in order to be a “meaningful player” in the
 18 memory segment (including DRAM), a few of the prerequisites for market players are: (1) leading-
 19 edge technology; (2) intellectual property; (3) large scale of production; and (4) higher quality
 20 products. He added that large global customers want to make sure that the product are designed to
 21 have proper intellectual property (“IP”) rights, which Chinese new entrants did not currently possess.

1 These technological advancements are typically characterized by: (1) an increase in memory density
 2 (which can be achieved by reducing the die size, i.e., size of the chip, or the process node, i.e., the
 3 distance between transistors); (2) by an increase in speed of chip, i.e., the amount of data that can be
 4 transferred in a certain period of time; and (3) by a decrease in energy consumption, which can be
 5 done by reducing the operating current and voltage.

6 **D. Demand for DRAM is Inelastic**

7 162. “Elasticity” is a term used to describe the sensitivity of supply and demand to changes
 8 in one or the other. For example, demand is said to be “inelastic” if an increase in the price of a
 9 product results in only a small decline in the quantity sold of that product, if any. In other words,
 10 customers have nowhere to turn for alternative, cheaper products of similar quality, and so continue
 11 to purchase despite a price increase.

12 163. For a cartel to profit from raising prices above competitive levels, demand must be
 13 relatively inelastic at competitive prices. Otherwise, increased prices would result in declining sales,
 14 revenues, and profits, as customers purchased substitute products or declined to buy altogether.
 15 Inelastic demand is a market characteristic that facilitates collusion, allowing producers to raise their
 16 prices without triggering customer substitution and lost sales revenue.

17 164. Demand for DRAM is highly inelastic because there are no close substitutes for
 18 DRAM products. Because DRAM has no close substitutes, demand for DRAM will continue to rise
 19 as new products requiring DRAM hit the market – such as the proliferation of smartphones and other
 20 electronic devices. DRAM is the only type of memory that can serve as a substitute or functional
 21 equivalent to DRAM in those products and devices. Accordingly, a purchaser of DRAM has no
 22 choice but to be dependent on the few suppliers that exist – the Defendants.

23 165. The Defendants recognized the inelasticity of the DRAM market. At a December 6,
 24 2017 investor presentation, Micron’s CFO emphasized the consensus view of the industry that the
 25 DRAM market was inelastic: “there is a general belief that the industry participants are keenly aware
 26 of the fact that the DRAM market is relatively inelastic.”

27 166. Micron’s CFO on December 7, 2016 also contrasted the DRAM market, which it
 28 viewed as inelastic, against the NAND market, which it also competed in and viewed as much more

1 elastic: “our view is that the NAND market is much more price elastic than DRAM. So when
 2 DRAM was at its lowest point, you didn't see folks doubling down on the capacity of the PC and
 3 now the DRAM has recovered, you don't see folks having the capacity of the PC or a mobile phone.”

4 **E. Defendants' Increased Prices for DRAM Cannot Be Explained by Market Errors**

5 **1. DRAM costs remained low or stable during Class Period**

6 167. DRAM is primarily made from raw material silicon wafers and, therefore, every
 7 DRAM chipmaker needs to buy them so that they can be processed into chips. Yet, while prices for
 8 DRAM soared, the prices of silicon wafers – the primary ingredient in DRAM – declined or
 9 remained stable. For example, between 2013-2017, silicon wafer prices declined about a third, and
 10 more than a half since 2007 levels.

11 168. During the Class Period (and the years leading up to its start), research and
 12 development costs and capital expenditure costs for Defendants to produce DRAM also remained
 13 fairly stable.

14 169. Despite the lack of increases in raw material or other input costs, DRAM prices
 15 soared during the Class Period to astronomical levels. The average selling price (ASP) for DRAM
 16 rose by more than 40% between 2016 and 2017.

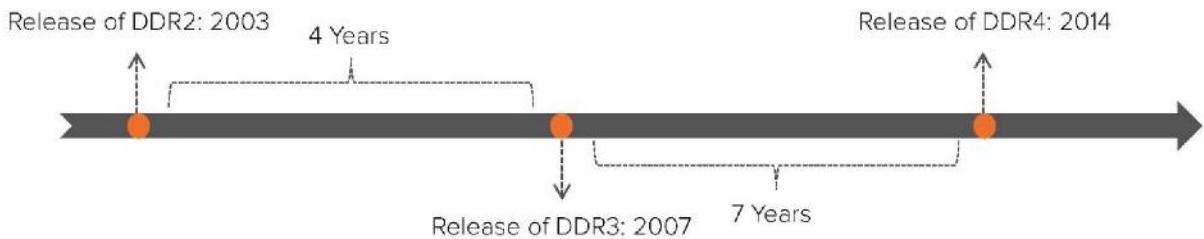
17 170. Prices for DRAM started to rise in the second half of 2016, and continued to rise
 18 during the Class Period. For example, PC DRAM (DRAM that is installed into computers)
 19 experienced one of the biggest upticks in contract pricing; likely ending the year 2017 with a 60%
 20 price increase over 2017. “The average contract price of mainstream 4GB DDR4 PC DRAM
 21 modules, for example, soared from \$13 at the end of Q2 2016 to \$30.5 in Q4 2017,” said April Wu,
 22 research director for DRAMeXchange. “This represents an increase of 130 percent over six
 23 consecutive quarters.”

24 **2. Price increases during the Class Period cannot be explained by the technology
 25 life cycle.**

26 171. The DRAM market is characterized by rapid technology advancements. As a new
 27 generation of DRAM comes to market (and replaces the prior generation), prices for the new
 28 generation can be expected to rise. Prior to the Class Period, this was the case with the transition of

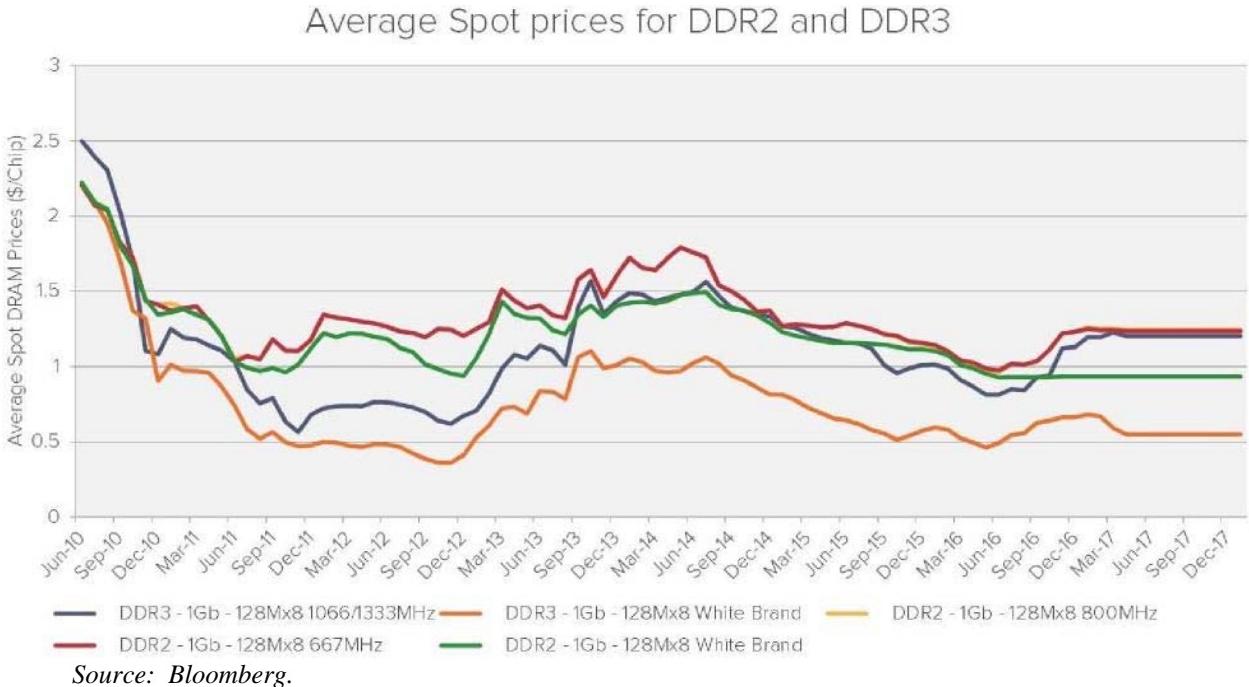
1 the product life cycle of DDR2 DRAM to the next generation, DDR3 DRAM. During the Class
 2 Period, when the transition was made from DDR3 DRAM to DDR4 DRAM, that was not the case,
 3 and the market deviated from the traditional price cycle.

4 172. The DRAM market is characterized by rapid technological advancements.
 5 Manufacturers are constantly cutting costs while meeting market demands for larger memory
 6 densities with higher speed. The timeline below illustrates the transitions through DDR2, DDR3,
 7 and DDR4 types of DRAM, and indicates that the impact of those transitions would pre-date the
 8 price increases during the Class Period.

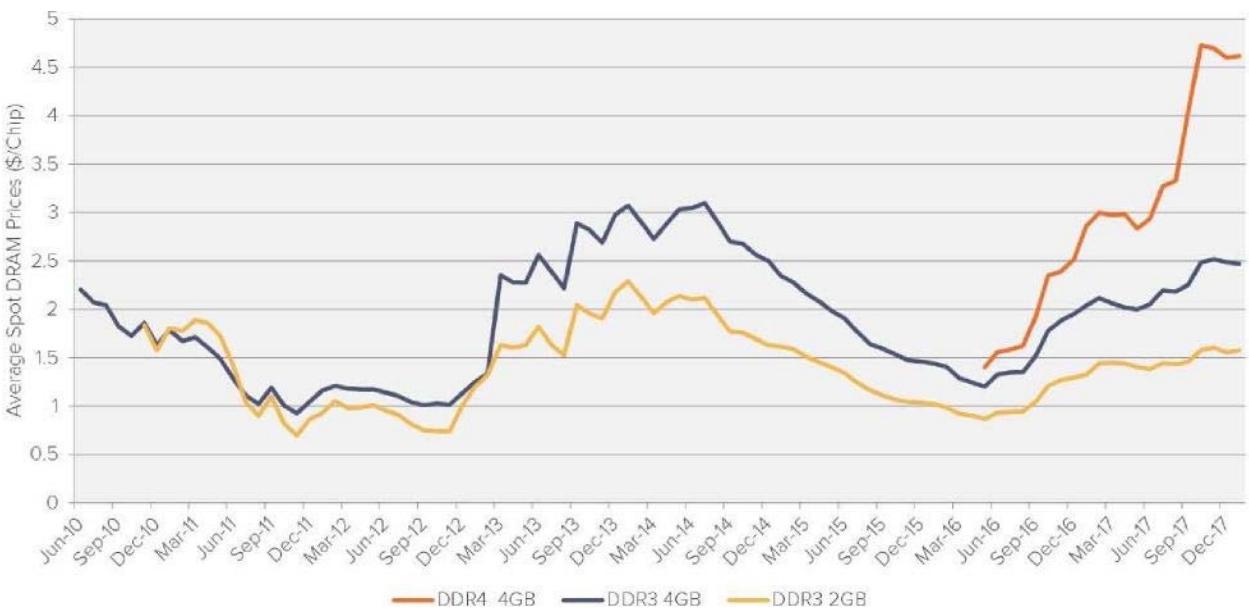


9
 10
 11
 12 173. Technological advancements are typically characterized by the following: (1) an
 13 increase in memory density (either by reducing die size, i.e., reducing the size of the chip, or
 14 reducing the process node, i.e., reducing the distance between transistors; (2) an increase in speed of
 15 chip (speeding up the amount of data that can be transferred in a certain period of time); and (3) a
 16 decrease in energy consumption (reducing the operating current and voltage). Each time a
 17 manufacturer applies one of the above methods, there is an associated learning curve.
 18

19 174. Typically, price trends in the DRAM industry are generally correlated with this product
 20 technology life cycle. At the beginning of new cycle, production and fixed costs are high to develop the
 21 next generation technology, resulting in higher prices for the new generation of DRAM. Gradually, as
 22 market demand increases for the newer generation DRAM, prices stabilize as the new generation
 23 replaces the old generation in the market. For example, as shown in the below chart, this was the case
 24 with the transition from DDR2 to DDR3 DRAM in the period December 2012 through September 2014:
 25
 26
 27
 28



175. The technology for DDR4 was introduced in 2014, long before the significant price increase that began with the start of the Class Period in June 2016. And, therefore, the transition from DDR3 to DDR4 cannot be used to explain the price increase that occurred sharply during the Class Period, as the transition to DDR4 would have occurred several years before.



176. DRAM makers' decrease in the node process also does not explain Defendants' price increases during the Class Period. From 2000, Defendants have been transitioning from a 130nm

1 process node technology to an 18nm process in 2016. The node process is expected to further
 2 decrease to 10nm by 2020. In 2015, one year after DDR4 was first introduced, the market was
 3 expected to benefit from the rising penetration of DDR4 built on 20nm technology. The transition
 4 from 25nm was said to increase bit capacity by 30% at their existing production facilities. Therefore,
 5 by 2016, manufacturers would have experienced sufficient increase in capacity from the move from
 6 25nm to 20 nm in 2014. This timeline does not correlate with the price increases that began during
 7 the Class Period; the impact of the node decreases would have come long before.

8 F. The Defendants' Profits Increased During the Class Period

9 177. During the Class Period, as prices for DRAM soared, so did Defendants' revenue.
 10 Defendants' revenue from global DRAM sales skyrocketed during the Class Period, with
 11 Defendants' revenue rising more than 50%. Between Q1 2016 and Q3 2017, Defendants' revenues
 12 from global DRAM sales more than doubled. In Q3 2017, Samsung achieved a record-high revenue
 13 of \$8.7 billion from its global DRAM sales (Q1 2016 revenue was \$3.9 billion); SK Hynix achieved
 14 record-high revenue of \$5.5 billion in Q3 2017 from its global DRAM sales (Q1 2016 revenue was
 15 \$2.3 billion), and Micron achieved record-high revenue of \$4.0 billion in Q3 2017 from its global
 16 DRAM sales (Q1 2016 revenue was \$1.5 billion).

17 1. Trade association participation provide many opportunities for Defendants to 18 share information and collude

19 178. Trade associations also foster ease of information sharing between Defendants in the
 20 DRAM industry, provide many opportunities for Defendants to have direct communications and
 21 collude.

22 a. Semiconductor Industry Association ("SIA")

23 179. According to its website, SIA is the voice of the U.S. semiconductor industry. Micron
 24 Technology is a member of the SIA, along with other domestic semiconductor manufacturers.
 25 Samsung and SK Hynix are listed as international members of the SIA. Sanjay Mehrotra, Micron
 26 Technology's President and CEO sits on the Board of the SIA. The SIA is affiliated with companion
 27 branches in other regions of the world including in Korea, Japan, China, and Europe. It is also linked
 28 to the World Semiconductor Trade Statistics, a non-profit, which is the "source of semiconductor

1 market data and forecasts,” and the World Semiconductor Council. Defendants belong to all of these
 2 associations.

3 180. The SIA holds various events, such as its “Annual Award Dinner” where Defendants’
 4 key executives attend. For example, at its annual dinner on November 14, 2017, Mark Durcan,
 5 Micron’s CEO at the time, was featured at the event as an award winner and potential speaker. The
 6 program of events for the November 14, 2017 meeting also included a CEO Reception and a Post-
 7 Party, providing further opportunities for social interaction or side conversations among members.

8 **b. Korean Semiconductor Industry Association (“KSIA”)**

9 181. Similar to the SIA, the KSIA provides opportunities for Defendants to be in contact
 10 and to directly communicate and share competitive information with one another.

11 182. KSIA’s membership list includes both SK Hynix and Samsung Electronics Co. on its
 12 device manufacturer member list, with only four other entities listed as device manufacturer
 13 members. This small number of member companies, makes it even more possible for members to be
 14 in contact and have a means to exchange information.

15 183. In March 2016, Sung Wook Park, the CEO and Vice Chairman of SK Hynix was
 16 inducted as the 9th President of the KSIA.

17 184. The KSIA also holds events and conferences for its members. For example, the KSIA
 18 has held an annual meeting each year between 1994 and 2016. SK Hynix is noted as one of the
 19 event organizers for at least the 2016 annual meeting.

20 185. The KSIA is connected to the SIA and other regional branch organizations such as in
 21 the U.S., Japan, China, the EU, and Taiwan. At times, the various branches get together for
 22 worldwide conferences and events, providing further opportunities for Defendants to join together in
 23 person.

24 186. While much of the information on these organizations is kept private for members
 25 only, these organizations clearly provided a channel through which Defendants had the opportunity
 26 to discuss and/or exchange information directly during the Class Period.

27 187. Given the small number of DRAM makers, these opportunities to collude lend even
 28 further plausibility to Plaintiffs’ collusion allegations.

1 **c. World Semiconductor Council (“WSC”)**

2 188. The SIA is also affiliated the World Semiconductor Council, which “promotes
 3 international cooperation in the semiconductor sector in order to facilitate the healthy growth of the
 4 industry from a long-term global perspective.” The WSC holds at least one meeting a year. For
 5 example, in April 2018, it held its World Semiconductor Council Meeting for WSC Members Only
 6 in Coronado, California. Notably, the WSC held a meeting of over 100 CEOs and other
 7 semiconductor executives on May 26, 2016 (a few days before the start of the Class Period on June
 8 1, 2016). The conference was led by Sung Wook Park (CEO of SK Hynix and President of the
 9 Korean Semiconductor Industry Association, discussed further below).

10 **d. World Semiconductor Trade Statistics Organization (“WSTS”)**

11 189. Defendants also participate in the WSTS, a non-profit, which is the “source of
 12 semiconductor market data and forecasts.” WSTS compiles monthly sales numbers for the
 13 semiconductor industry, including DRAM, and provides twice-yearly semiconductor industry
 14 forecasts with quarterly and annual projections. A subscription to the WSTS Database also includes
 15 statistics on Semiconductor Capacity Utilization (known as SICAS Reports). WSTS is primarily
 16 funded by membership fees of participating semiconductor companies, whose representatives form
 17 the WSTS Committee. The members of this Committee submit accurate and authentic monthly
 18 revenue data, attend regional meetings, and contribute to the generation of world semiconductor
 19 industry forecasts.

20 190. “Semiconductor companies may become WSTS members. Membership both
 21 comprises the obligation to feed the member company's revenue data regularly into the appointed
 22 Data Collection Agents and fund the operation and services of WSTS by membership fees.
 23 Reciprocally Members have access to all Information Services that WSTS provides.” ...
 24 “Semiconductor companies that are unable to report revenue data into the WSTS statistics programs
 25 (e.g., if they are not shipping any semiconductor products that generate revenues in any one of the
 26 recognized WSTS product categories) may obtain access to WSTS Information as Subscribers with
 27 WSTS.

1 191. All three Defendants are members of WSTS. Micron is a member of the Americas
 2 Regional Group, and Samsung and SK Hynix are members of the Asia Pacific Regional Group.

3 192. Several partners support WSTS in the operation of market statistics information
 4 services. Data Collection Agents (“DCAs”) receive the revenue data from WSTS member
 5 companies and keep this data under their custody. WSTS has appointed regional DCAs who collect
 6 revenue data from member companies and consolidate this data into the regional base report.
 7 Regional DCAs forward the regional base report at defined dates to the worldwide DCA. The
 8 worldwide DCA consolidates all the data of the regional base reports and merges this data with non-
 9 participant estimates that are provided by WSTS. DCAs have also the responsibility to check the
 10 submitted data for completeness, consistency and plausibility. They will resolve any perceived data
 11 anomalies with the submitting member companies. Finally, the worldwide DCA posts these data
 12 compilations under the name of the various market statistics reports on the WSTS Internet Portal.

13 193. In its promotional materials, the WSTS notes that the membership gives “exclusive
 14 access to the only source of market figures collected directly from semiconductor companies.” The
 15 materials explain how information is collected from members: “Individual member companies enter
 16 unit sales and revenue data into a simple online form on a monthly (in some cases quarterly) basis.”

17 194. Semiconductor Industry Associations in the different regions closely cooperate with
 18 WSTS. In most cases they also hold distribution licenses for WSTS market statistic reports and
 19 forecasts to serve interested parties outside the WSTS membership with their information needs.

20 195. In addition, the WSTS holds meetings for its members. For example, it held its spring
 21 2018 Committee Meeting in Vienna, Austria. As explained on its meeting registration page, “each
 22 WSTS Member Company has one official representative in the Committee, who is expected to
 23 participate in the Committee Meeting.” Participation in the Forecast Meeting is subject to the
 24 submission of a pre-meeting forecast. The process includes companies submitting their forecast
 25 information and then publication of the pre-meeting average forecast to all participating companies.

26 196. WSTS describes the value of its regular meetings as “an important venue for members
 27 to help shape forecasts and future reports, and to interact with their industry peers. ... Members are
 28 able to exchange experiences with other market participants, gain important information about

1 current market sentiment, and hear directly from their peers how they view the future direction of the
 2 market.”

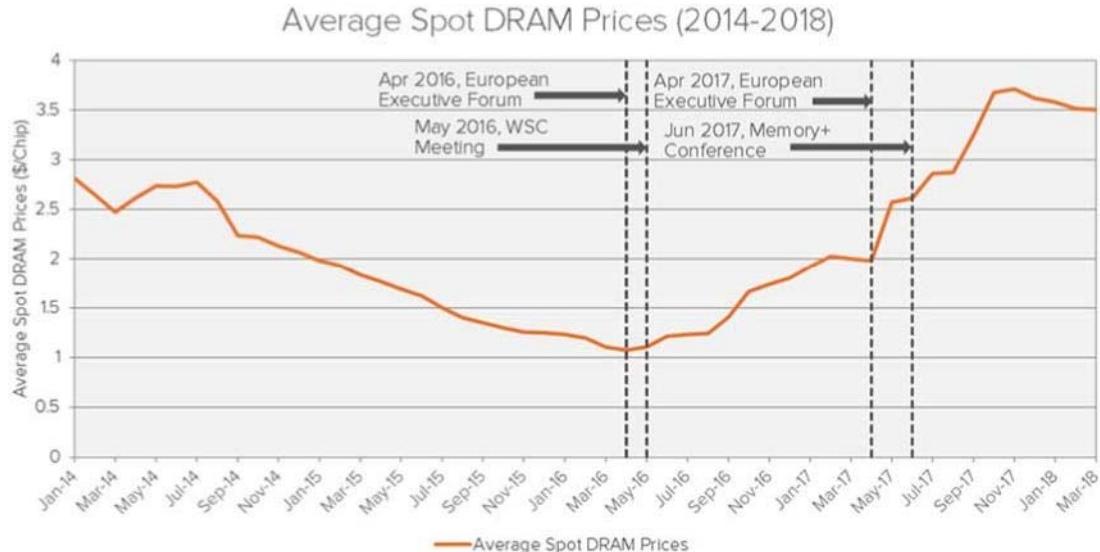
3 197. WSTS holds a number of different types of meetings for members, including: Board
 4 of Directors Meetings (at least twice a year); Executive Committee Meetings, including the World
 5 Chairman and the five Regional Chairs (at least twice a year); Working Group Meetings where
 6 certain WSTS members gather in regional or sector-specific groups; Committee Meetings where
 7 members’ primary focus is to review the current situation in the semiconductor market and to
 8 formulate forecasts for the upcoming quarters and following two years (twice a year); and Regional
 9 Chapter Meetings (two to four times per year).

10 e. **Global Semiconductor Alliance (“GSA”)**

11 198. The GSA represents about 350 member companies, including Micron, Samsung, and
 12 SK Hynix. The GSA holds a Memory Conference once every two years. For example, the
 13 conference was held in March 2015 and June 2017. The GSA also holds an annual US Executive
 14 Forum conference in September or October, an annual European Executive Forum in April, May, or
 15 June, and an Annual Awards Dinner in December.

16 2. **Trade association meetings in which Defendants participate can be correlated
 17 with price increases during the Class Period**

18 199. The graph below shows how average DRAM spot prices moved during the period
 19 from January 2014 to the end of 2017. The price increase in May 2016 coincides with four trade
 20 association meetings. Specifically, prices increased from one event to another, and can be seen close
 21 in time with key trade association meeting:
 22
 23
 24
 25
 26
 27
 28



200. Notably, there was an increase in DRAM prices after the DRAM European Executive Forum in April 2016. The average monthly increase for DRAM from April 2016 to March 2018 is 5.6%, where before the Class Period (from March 2011 to March 2016), the average monthly increase for DRAM was -0.14%. Defendants' overlapping business relationships provide further opportunities for Defendants to collude. The chart below shows how during the Class Period prices increased after certain key meetings in April-May 2016 and April-May 2017.

The table below shows that DRAM prices have on an average increased after some of the key meetings held by industry associations:

				Average Monthly % Change in Prices (Positive Figure Implies Price Increase)	
Association	Event	Before Event Period	After Event Period	Before	After
GSA	European Executive Forum	Jan 2014 - Mar 2016	Apr 2016 - Mar 2018	-3.45	5.18
WSC	WSC Annual Meeting	Jan 2014 - Apr 2016	May 2016 - Mar 2018	-3.42	5.64
GSA	European Executive Forum	Jan 2014 - Mar 2017	Apr 2017 - Mar 2018	-0.70	5.70
GSA	Memory+ Conference	Jan 2014 - May 2017	Jun 2017 - Mar 2018	0.04	3.49

201. In addition to the transparency and ease of information sharing that comes from being
in such as small industry where many of Defendants' employees likely know each other, Defendants

1 also have overlapping business relationships with each other, which provide opportunities to
 2 exchange information and collude. For example, prior to joining Micron as its CEO in February
 3 2017, Sanjay Mehrotra was President of SanDisk, a Flash Memory manufacturer. Starting in 2014,
 4 SanDisk and SK Hynix were involved in litigation against each other regarding a dispute over trade
 5 secrets. In August 2015, SanDisk announced that it had reached agreement with SK Hynix (led by
 6 CEO Sung Wook Park). As a result of the settlement, the two companies publicly announced
 7 intentions to modify and extend their intellectual property relationship and to enter into a multi-year
 8 commercial relationship under which SK Hynix agrees to supply DRAM products to SanDisk
 9 through 2023. Therefore, it is plausible that these two CEOs – Sung Wook Park and Sanjay
 10 Mehrotra knew each other through this effort.

11 **VII. DEFENDANTS' PRIOR COLLUSION IN THE DRAM MARKET, AND RELATED 12 MARKETS, MAKES COLLUSION EVEN MORE PLAUSIBLE HERE**

13 **A. Defendants Were Previously Convicted for Fixing Prices of DRAM**

14 202. This is not the first time Defendants stand accused of colluding in the DRAM market.

15 203. In 2005, the Department of Justice brought a criminal case against the same
 16 Defendants named here, and other DRAM manufacturers, for fixing prices of DRAM between April
 17 1, 1999 and June 15, 2002. That action resulted in guilty pleas and jail time, and resulted in
 18 Defendants paying some of the largest criminal fines in history. The Defendants and their co-
 19 conspirators paid a collective \$731 million in criminal fines, and served a collective 3,185 days of
 20 jail time.

21 204. In November 2005, SEC and SSI – the same Samsung Defendants as named herein –
 22 pleaded guilty to criminal charges brought by the DOJ, and agreed to pay a \$300 million criminal
 23 fine. The guilty plea admitted that between April 1, 1999 and June 15, 2002, Samsung conspired “to
 24 fix the prices of DRAM sold to certain computer and server manufacturers.” Affected customers
 25 included Dell, Compaq, Hewlett Packard, Apple, IBM, and Gateway.

26 205. In April 2006, a number of Samsung employees also entered individual guilty pleas,
 27 including Sun Woo Lee (SEC Senior Manager of DRAM sales), Yeongho Kang (SSI Associate
 28 Director of DRAM Marketing), and Young Woo Lee (Sales Director for SEC’s German subsidiary).

1 Those guilty pleas covered various periods from as early as January 1, 1998 until on or about June
 2 15, 2002, wherein those individuals conspired “to fix the prices of DRAM sold to certain computer
 3 and server manufacturers in the United States.” Each employee was sentenced to pay a \$250,000
 4 fine and a prison sentence ranging from 7-10 months.

5 206. Samsung employee Il Ung Kim (SEC’s Vice President of Marketing in the Memory
 6 Division) pleaded guilty for his role in the DRAM conspiracy and was sentenced to pay a \$250,000
 7 fine and serve a 14-month prison sentence.

8 207. Samsung employee Young Hwan Park (Vice President of Sales for SEC and President
 9 of SSI) pleaded guilty in December 2006. This guilty plea covered the period April 1, 2001, until on
 10 or about June 15, 2002, wherein Mr. Park conspired “to fix the prices of DRAM sold to certain
 11 OEMs.” Mr. Park was sentenced to a \$250,000 fine and a 10-month prison sentence.

12 208. In September 2006, Samsung employee Thomas Quinn (SSI Vice President of
 13 Marketing for Memory Products) pleaded guilty “to fix[ing] the prices of DRAM sold to certain
 14 OEMs.” Mr. Quinn was sentenced to pay a \$250,000 fine and serve an 8-month prison sentence.

15 209. In May 2005, SK Hynix (f/k/a Hynix Semiconductor, Inc. or “Hynix”) pleaded guilty
 16 and was fined \$185 million. The guilty plea covered the period April 1, 1999, to June 15, 2002,
 17 wherein Hynix “conspired to fix the prices of DRAM to certain computer and server manufacturers.”
 18 Hynix admitted that the affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM,
 19 and Gateway.

20 210. In the case against it by the DOJ, “Hynix,” acknowledged that at least 15 of its
 21 executives had contacts with competitors related to pricing in the DRAM market.

22 211. In March 2006, Hynix employees Dae Soo Kim (Hynix Senior Vice President and
 23 General Manager of Worldwide Sales and Marketing), Chae Kyun Chung (Hynix Director of
 24 Worldwide Strategic Account Sales), Kun Chul Suh (Hynix Senior Manager in Memory Products
 25 Marketing), and Choong Yub Choi (General Manager for Marketing and Sales of Hynix’s German
 26 subsidiary) entered individual guilty pleas for their participation in the DRAM conspiracy. Those
 27 guilty pleas covered various periods from April 1, 2001, until on or about June 15, 2002, and
 28 acknowledged that these individuals “conspired to fix the prices of DRAM to certain computer and

1 server manufacturers.” Affected customers included Dell, Compaq, Hewlett Packard, Apple, IBM,
 2 and Gateway. Each of those individuals was fined \$250,000 and received prison sentences ranging
 3 from five to eight months.

4 212. Gary Swanson, Senior Vice President of Memory Sales and Marketing at Hynix
 5 Semiconductor America, was indicted in October 2006 for fixing DRAM prices in violation of
 6 Section I of the Sherman Act.

7 213. The following are examples of SK Hynix’s illegal behavior in the prior DRAM
 8 conspiracy: (a) Hynix employee C.K. Chung collected pricing information from subordinates and
 9 competitors and relayed that information to D.S. Kim; (b) Hynix employee Paul Palonsky, a
 10 salesperson with responsibility for the IBM account, acknowledged in sworn testimony that he
 11 gathered competitor price information “directly from competitors, including Samsung, Micron,
 12 Infineon, Hitachi, Toshiba, Elpida, LG, and NEC”; (c) Hynix was aware of Samsung and Micron
 13 prices before it submitted a bid to Apple in August 2001; and (d) also in 2001, a Hynix email refers
 14 to the artificial product shortage created by Micron, and states that Micron will follow Samsung or
 15 Hynix if Apple accepts a price increase.

16 214. Micron faced criminal prosecution by the DOJ as well. However, Micron was given
 17 immunity from prosecution because it agreed to cooperate with the DOJ as part of the DOJ’s
 18 Antitrust Leniency Program.

19 215. Micron admitted its participation in the DRAM conspiracy as part of its cooperation
 20 with the DOJ. In a sworn statement, Micron acknowledged that at least 31 of its executives and
 21 other employees had conspiratorial contacts with other DRAM manufacturers, including Hynix and
 22 Samsung, as well as other makers that were part of the market at that time, including Hitachi, Elpida,
 23 NEC, Mosel Vitelic, Nanya, Winbond, and Toshiba, and admitted conspiratorial conduct with regard
 24 to at least the following customers: Apple, Dell, Compaq, IBM, Gateway, Sun, Cisco, Thomson,
 25 Seagate, Hewlett Packard, and Maxtor.

26 216. Micron executives also provided lengthy interviews to the government to obtain
 27 individual amnesty and to discharge their cooperation obligations. Michael Sadler, Micron’s Senior
 28 Vice President for Marketing, testified at the trial of Mr. Gary Swanson of Hynix, detailing how the

1 DRAM conspiracy was carried out. Mr. Sadler testified that he participated in a “worldwide tour” to
 2 seek the cooperation of other manufacturers to restrict production. Mr. Sadler described this trip to
 3 the DOJ as “slam-dunk” illegal, and acknowledged that he was an “originator of that idea.” Mr.
 4 Sadler also testified that he discussed pricing at two “core accounts” with Mr. Swanson, and that
 5 those discussions “set a benchmark” for discussions with other customers. Based on their
 6 discussions, Mr. Sadler concluded that he had an “understanding” with Mr. Swanson that Micron and
 7 Hynix were “on the same page.” Mr. Sadler also testified that on one occasion, Mr. Swanson
 8 confirmed to him that Hynix was going to raise certain prices and that Mr. Sadler responded
 9 indicating that Micron would do the same.⁸

10 217. Mr. Sadler is currently Chief Strategy Officer at Micron, and, as such, has close
 11 contact with those such as Micron’s CFO and CEO, who are responsible for Micron’s DRAM
 12 operations, and who those that made the statements during earnings calls, that are alleged to have
 13 facilitated the conspiracy alleged herein.

14 218. Despite being given general immunity, one Micron executive, Regional Manager
 15 Alfred Censullo pleaded guilty to an obstruction of justice charge, whereby Mr. Censullo admitted to
 16 having withheld and altered documents responsive to a grand jury subpoena served on Micron. Mr.
 17 Censullo was sentenced to serve six months of home detention.

18 **1. Prior DRAM – Other Regulators**

19 219. The DOJ was not the only regulator to prosecute Defendants for participation in the
 20 prior DRAM conspiracy.

21 220. On October 19, 2011, Samsung was fined €145,727 million by the European
 22 Commission (“EU”) for its role in fixing prices as part of a DRAM conspiracy between July 1, 1998
 23 to June 15, 2002. Samsung received a reduction in its fines for acknowledging the cartel to EU
 24 investigators. The EU also fined Micron for its role in the same price-fixing conspiracy. However,
 25 Micron avoided payment as a result of being the first firm to reveal the cartel to investigators, and for
 26 its cooperation with the EU regulatory body.

27 ⁸ Transcript of Record, *United States v. Swanson*, No. 4:06-cr-00692 PJH-3 (N.D. Cal. Feb. 12,
 28 2008).

1 221. In 2002, the Canadian authorities also began an investigation into price-fixing in the
 2 DRAM market. Due to the recession, Canadian authorities put the investigation on hold. However,
 3 the investigation resumed on or about 2014 (after the EU investigation and case had concluded).
 4 After presenting evidence to Samsung and the other DRAM makers, Samsung and the other
 5 companies agreed to a \$120 million settlement agreement, with a \$40 million fine, and \$80 million to
 6 be paid back to Canadians who purchased computers (laptops or desktops), printers, memory
 7 modules, graphics cards, video game consoles, DVD players, personal digital assistants, MP3
 8 players, personal video recorders, servers, computer based point of sale systems, or any other
 9 products containing DRAM between April 1, 1999 to June 30, 2002.

10 **2. Prior DRAM Civil Cases (Direct and Indirect)**

11 222. The same Defendants as named here were also named in prior civil litigations, which
 12 alleged they participated in a conspiracy to fix prices of DRAM between 1999 and 2002. See *In Re*
 13 *Dynamic Random Access Memory (DRAM) Antitrust Litig.*, Master File No. M:02-cv-01486-PJH
 14 (N.D. Cal.). Settlements in those prior civil actions are among the largest civil price-fixing
 15 settlements in history, with the direct purchaser action totaling over \$350 million in settlements, and
 16 the indirect purchaser action totaling over \$310 million in settlements.

17 **B. Other Semiconductor Memory Products**

18 **1. SRAM**

19 223. Following on the heels of the prior DRAM criminal case investigation, and noting the
 20 overlap of DRAM and SRAM makers and key executives, the DOJ launched an investigation of
 21 price-fixing violations by Defendants (and others in the SRAM market).

22 224. Micron acknowledged the DOJ's SRAM investigation in its 2007 Form 10-K: "On
 23 October 11, 2006, we received a grand jury subpoena from the U.S. District Court for the Northern
 24 District of California seeking information regarding an investigation by the DOJ into possible
 25 antitrust violations in the 'Static Random Access Memory' or 'SRAM' industry."

26 225. Samsung was also part of the DOJ's SRAM investigation. October 13, 2006, the DOJ
 27 announced that it had started the antitrust investigation, and that Samsung (SEC) had been asked to
 28 submit related documents and pledged a full cooperation with the probe.

1 226. On November 1, 2006, CNet News reported that SEC, the world's biggest maker of
 2 memory chips, said its German offices were raided as part of a European Union probe into suspected
 3 price-fixing of SRAM chips. "We were raided on Oct. 11 in connection with our SRAM products,"
 4 a representative for Samsung Germany said Wednesday. "We are cooperating in full with the
 5 investigation." The European Commission said Tuesday it had raided the offices of several makers
 6 of SRAM chips in Germany, suspecting price-fixing in the sector.

7 227. From IDG News Service October 31, 2006: The U.S. Department of Justice probe
 8 into the SRAM (static RAM) chip market appears to be widening. Sony Corp. said Tuesday that its
 9 U.S. unit, Sony Electronics Inc., has received a subpoena from the DOJ seeking information on its
 10 SRAM business. In a brief statement the company said it will cooperate with the request. Earlier
 11 this month, four other SRAM companies said they had also been contacted by the DOJ. They are
 12 Cypress Semiconductor Corp., which was first to announce it had been contacted, and the U.S. units
 13 of Mitsubishi Electric Corp., Samsung Electronics Co. Ltd. and Toshiba Corp.

14 **2. Flash**

15 228. On or about September 2007, the DOJ confirmed that it was investigating potential
 16 antitrust violations by Samsung (SEC and SSI), SK Hynix and others for price-fixing in the Flash
 17 memory market. Samsung was among the entities that received grand jury subpoenas in connection
 18 with the investigation. *In re Flash Memory Antitrust Litig.*, 643 F. Supp. 2d 1133, 11400 (N.D. Cal.
 19 Mar. 31, 2009) (Flash MTD Order).

20 229. In 2012, Samsung and SK Hynix settled claims alleging that they conspired with
 21 SanDisk Corp. and other makers to fix prices on flash memory through unlawful patent licensing
 22 deals and other misconduct. The underlying suit, which was first filed in 2007, alleged that the Flash
 23 defendants engaged in illegal meetings with each other with the intent to boost the price of Flash
 24 memory products that were used in digital cameras, flash drives, portable music players, and other
 25 electronic devices. *In re: Flash Memory Antitrust Litigation*, No. 4:07-cv-00086-SBA (N.D. Cal.).

VIII. EFFECTS OF DEFENDANTS' MISCONDUCT

A. The Inflated Prices for DRAM caused by Defendants' Conduct Passed on to Consumers

230. Defendants' anticompetitive behavior resulted in harm to Plaintiffs and other members of the proposed Classes because it caused them to pay higher prices for device products containing than they would have otherwise paid if not for Defendants' business practices. The entire overcharge for DRAM devices was passed on to the members of the proposed Class.

231. DRAM is a commodity product with standard specifications. DRAM is incorporated into a variety of electronic consumer products, including computers and phones, which are also commodity products.

232. The indirect purchaser purchases devices containing DRAM either from (1) an OEM manufacturer of products containing DRAM or (2) a reseller, such as a retailer or wireless network. Thus, Defendants' revenues from DRAM follow a traceable chain from Defendants to the consumer.

233. The OEM and retail markets for devices containing DRAM are subject to vigorous price competition. OEMs and retailers have thin net margins and are at the mercy of their component costs. Increases in the price of DRAM will lead to corresponding price raises at the OEM and retailer levels for DRAM Devices.

234. As a result, the inflated prices of devices containing DRAM resulting from Defendants' anticompetitive practices have been passed on to Plaintiffs and other members of the proposed Class by direct-purchaser manufacturers, distributors, and retailers.

235. Economic theory teaches that the only situations in which precisely zero pass-through occurs is when an industry faces a perfectly elastic demand for its product (i.e., the price was fixed, with demand dropping to zero with an infinitesimal price increase, and expanding infinitely if price were to drop infinitesimally), or if supply was perfectly inelastic (i.e., if even a very large increase in price for a product was incapable of stimulating additional supply).⁹ These possibilities are considered implausible by economists. Either scenario is at odds with the nature of the device industries. Existing empirical studies of the electronics industry have concluded that demand is *not*

⁹ The usual hypothesis that is commonly examined in empirical pass through studies is whether pass-through exceeds, falls short of or equals 100 percent.

1 infinitely elastic. Therefore, at least a partial pass-through of an increase in the costs of DRAM into
 2 the price of DRAM Devices – and consequent harm to class members – is the predicted outcome of a
 3 successful cartel behavior.

4 236. To the extent that distributors, wholesalers, and retailers selling to consumers or to
 5 others in the distribution chain price their sales as their cost plus a fixed markup, this will create an
 6 additional reason for pass-through to exceed 100 percent through these channels.¹⁰ Further, because
 7 retailers ultimately compete with direct sales to purchasers by device manufacturers, competitive
 8 forces would likely work to equalize end-purchaser prices between channels, after controlling for the
 9 value of differences in support across different distribution channels. This would tend to push the
 10 total pass-through rate from costs to end-purchaser pricing above 100 percent, since manufacturers
 11 could not sustain a pricing policy to distributors that did not cover their costs, and an additional fixed
 12 markup on top of distributor cost would result in a total pass-through rate to final consumers in
 13 excess of 100 percent.

14 237. Thus, the extent to which input cost increases are passed through into output prices is
 15 entirely an empirical issue, and it is an area in which methods of empirical analysis are well
 16 established. Based on both theory and the published studies in this area, it is likely that the pass-
 17 through rates of inflated costs on DRAM will exceed 100 percent, a situation known as
 18 “overshifting.”

19 238. In particular, it is undisputed that overshifting is possible in markets with many
 20 suppliers of differentiated products and easy entry and exit, an environment known as “monopolistic
 21 competition.” Indeed, pass-through in excess of 100 percent would actually be expected in industries
 22 where firms produce differentiated products in competitive conditions, and face economies of scale –
 23 that is, where their average cost of producing a product declines with their level of output. In
 24 particular, as noted next, in competitive industries with differentiated products and relatively easy

25
 26 ¹⁰ For example, if a wholesaler prices its product at manufacturer sales price plus 10 percent, and
 27 a retailer prices its product at wholesale plus 10 percent, the total pass-through to the final consumer
 28 will be 121 percent (i.e., 110 percent times 110 percent) of manufacturer sales price. Certain
 distributor costs, like the costs of holding inventory, and “shrinkage,” may be approximately
 proportional to the value of the products held, and thus be one factor creating this pricing policy.

1 entry and exit (monopolistic competition), when there are economies of scale, overshifting will be
 2 the rule, not the exception. Empirical studies by economists have characterized the personal
 3 computer industry as an industry which fits this description. For this reason, it is likely that pass-
 4 through is greater than 100 percent, in the market conditions that prevail for most, if not all, types of
 5 mass market computer and consumer electronics equipment.

6 239. Thus, Plaintiffs and other members of the proposed Class have been forced to pay
 7 supracompetitive prices for devices containing DRAM. These inflated prices have been passed on to
 8 them by direct purchaser manufacturers, distributors, and retailers.

9 IX. CLASS ACTION ALLEGATIONS

10 240. Plaintiffs bring this action under Federal Rule of Civil Procedure 23(b)(2) and
 11 23(b)(3) on behalf of themselves and on behalf of the following class (the “Class”) for claims arising
 12 under California law and the Sherman Act:

13 All persons and entities residing in the United States who from July 1,
 14 2016 through the February 1, 2018, purchased, paid and/or provided
 15 reimbursement for some or all of the purchase price for DRAM
 16 Devices (“relevant DRAM Devices”) from July 1, 2016 through
 17 February 1, 2018. This class excludes the Defendants; the officers,
 18 directors or employees of the Defendants; and any subsidiary, affiliate
 19 or other entity in which Defendants have a controlling interest. The
 20 Class also excludes all federal, state or local governmental entities, all
 21 judicial officers presiding over this action and their immediate family
 22 members and staff, and any juror assigned to this action.

23 241. In the event California law is not applied to the claims of all Class members for
 24 damages regardless of where they reside, Plaintiffs will seek certification of the following subclass
 25 (“Subclass”) under Rule 23(b)(3) for damages, under the laws of the Indirect Purchaser States (as
 26 defined below), in addition to the certification of the Class under Rule 23(b)(2) for purposes of
 27 injunctive relief:

28 All persons and entities residing in the United States who purchased,
 29 paid and/or provided reimbursement for some or all of the purchase
 30 price for DRAM Devices (“relevant DRAM Devices”) from July 1,
 31 2016 through February 1, 2018. This class excludes the Defendants;
 32 the officers, directors or employees of the Defendants; and any
 33 subsidiary, affiliate or other entity in which Defendants have a
 34 controlling interest. The Class also excludes all federal, state or local
 35 governmental entities, all judicial officers presiding over this action
 36 and their immediate family members and staff, and any juror assigned
 37 to this action.

1 242. Plaintiffs will seek certification of the following subclasses (collectively, the “State
 2 Classes”) for damages for claims under the antitrust statutes and/or consumer protection statutes of
 3 each of the following jurisdictions:

- 4 a. **Arizona Indirect Purchaser Class:** Under Arizona law, all persons and
 entities who, as residents of Arizona, indirectly purchased a DRAM Device
 during the Class Period for their own use and not for resale.
- 5 b. **Arkansas Indirect Purchaser Class:** Under Arkansas law, including Ark.
 Code Ann. § 4-75-212-315(a)(3), all persons and entities who, as residents of
 Arkansas, indirectly purchased a DRAM Device during the Class Period for
 their own use and not for resale.
- 6 c. **California Indirect Purchaser Class:** Under California Law, including
 Section 17200, all persons and entities who, as residents of California,
 indirectly purchased a DRAM Device during the Class Period for their own
 use and not for resale.
- 7 d. **District of Columbia Indirect Purchaser Class:** Under District of Columbia
 law, including D.C. Code § 28-4509(a), all persons and entities who, as
 residents of the District of Columbia, indirectly purchased a DRAM Device
 during the Class Period for their own use and not for resale.
- 8 e. **Florida Indirect Purchaser Class:** Under Florida law, including the Florida
 Deceptive and Unfair Trade Practices Act, all persons and entities who, as
 residents of Florida, indirectly purchased a DRAM Device during the Class
 Period for their own use and not for resale.
- 9 f. **Hawaii Indirect Purchaser Class:** Under Hawaii law, including H.R.S. 480-
 1 et seq., all persons and entities who, as residents of Hawaii, indirectly
 purchased a DRAM Device during the Class Period for their own use and not
 for resale.
- 10 g. **Illinois Indirect Purchaser Class:** Under Illinois law, all persons and entities
 who, as residents of Illinois, indirectly purchased a DRAM Device during the
 Class Period for their own use and not for resale.
- 11 h. **Iowa Indirect Purchaser Class:** Under Iowa law, including the Iowa
 Competition Law, all persons and entities who, as residents of Illinois,
 indirectly purchased a DRAM Device during the Class Period for their own
 use and not for resale.
- 12 i. **Kansas Indirect Purchaser Class:** Under Kansas law, including Kan. Stat.
 Ann. § 50-161, all persons and entities who, as residents of Kansas, indirectly
 purchased a DRAM Device during the Class Period for their own use and not
 for resale.

- 1 j. **Maine Indirect Purchaser Class:** Under Maine law, including Me. Rev.
 2 Stat. Ann., tit. 10, § 1104(1), all persons and entities who, as residents of
 3 Maine, indirectly purchased a DRAM Device during the Class Period for their
 own use and not for resale.
- 4 k. **Michigan Indirect Purchaser Class:** Under Michigan law, including Mich.
 5 Comp. Laws § 445.778(1), all persons and entities who, as residents of
 Michigan, indirectly purchased a DRAM Device during the Class Period for
 their own use and not for resale.
- 6 l. **Minnesota Indirect Purchaser Class:** Under Minnesota law, including
 7 Minn. Stat. § 325D.57, all persons and entities who, as residents of Minnesota,
 8 indirectly purchased a DRAM Device during the Class Period for their own
 use and not for resale.
- 9 m. **Mississippi Indirect Purchaser Class:** Under Mississippi law, including
 10 Miss. Code Ann. § 75-21-9 (2009), all persons and entities who, as residents
 of Mississippi, indirectly purchased a DRAM Device during the Class Period
 for their own use and not for resale.
- 11 n. **Nebraska Indirect Purchaser Class:** Under Nebraska law, including Neb.
 12 Rev. Stat. § 59-821, all persons and entities who, as residents of Nebraska,
 13 indirectly purchased a DRAM Device during the Class Period for their own
 use and not for resale.
- 14 o. **New Hampshire Indirect Purchaser Class:** Under New Hampshire law,
 15 including N.H. Rev. Stat. § 356:11, all persons and entities who, as residents
 of New Hampshire, indirectly purchased a DRAM Device during the Class
 Period for their own use and not for resale.
- 16 p. **New Mexico Indirect Purchaser Class:** Under New Mexico law, including
 17 N.M. Stat. Ann. § 57-1-3, all persons and entities who, as residents of New
 Mexico, indirectly purchased a DRAM Device during the Class Period for
 their own use and not for resale.
- 18 q. **New York Indirect Purchaser Class:** Under New York law, including N.Y.
 19 Gen. Bus. Law § 349(a), all persons and entities who, as residents of New
 York, indirectly purchased a DRAM Device during the Class Period for their
 own use and not for resale.
- 20 r. **North Carolina Indirect Purchaser Class:** Under North Carolina law, all
 21 persons and entities who, as residents of North Carolina, indirectly purchased
 a DRAM Device during the Class Period for their own use and not for resale.
- 22 s. **North Dakota Indirect Purchaser Class:** Under North Dakota law,
 23 including N.D. Cent. Code §§ 646.780, all persons and entities who, as
 residents of North Dakota, indirectly purchased a DRAM Device during the
 Class Period for their own use and not for resale.

- t. **Oregon Indirect Purchaser Class:** Under Oregon law, including Or. Rev. Stat. § 646.780, all persons and entities who, as residents of Oregon, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - u. **South Dakota Indirect Purchaser Class:** Under South Dakota law, including S.D. Codified Laws § 37-1-33, all persons and entities who, as residents of South Dakota, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - v. **Tennessee Indirect Purchaser Class:** Under Tennessee law, all persons and entities who, as residents of Tennessee, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - w. **Utah Indirect Purchaser Class:** Under Utah law, all persons and entities who, as residents of Utah, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - x. **Vermont Indirect Purchaser Class:** Under Vermont law, including Vt. Stat. Ann. Title 9 § 2465, all persons and entities who, as residents of Vermont, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - y. **West Virginia Indirect Purchaser Class:** Under West Virginia law, including W. Va. Code § 47-18-1, all persons and entities who, as residents of West Virginia, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.
 - z. **Wisconsin Indirect Purchaser Class:** Under Wisconsin law, including Wis. Stat. Ann. § 133.18(1)(a), all persons and entities who, as residents of Wisconsin, indirectly purchased a DRAM Device during the Class Period for their own use and not for resale.

243. Plaintiffs do not know the exact number of Class and State Class members but believe that the Class and State Classes include millions of members. Plaintiffs believe that joinder of all Class and State Class members is impracticable. Fed. R. Civ. P. 23(a)(1).

244. Common questions of law and fact exist as to all members of the Nationwide Class and Pennsylvania Class. Such questions of law and fact common to the Class and Pennsylvania Class include, but are not limited to, the following:

- Whether Defendants engaged in collusive conduct in the DRAM market, including restrictions on the growth of DRAM supply;
 - Whether Defendants' unlawful conduct enabled Defendants to increase, maintain, or stabilize above competitive levels the prices they charge for DRAM; if so,

whether such supracompetitive prices were passed on to Class and State Class members; and, if so, the appropriate classwide measure of damages;

- Whether Defendants violated Section 1 of the Sherman Act;
 - Whether Defendants violated Sections 16720 and 17200 of the California Business and Professions Code;
 - Whether Defendants violated the antitrust, unfair competition, consumer protection laws, and unjust enrichment laws as alleged below.

245. These common questions and others predominate over questions, if any, that affect only individual Class or State Class members. Fed. R. Civ. P. 23(a)(2) and 23(b)(3).

246. Plaintiffs' claims are typical of, and not antagonistic to, the claims of the other class members. By advancing their claims, Plaintiffs will also advance the claims of all class members, because Defendants participated in activity that caused all Class members to suffer similar injuries. Fed. R. Civ. P. 23(a)(3).

247. Plaintiffs will fairly and adequately protect the interests of absent Class members. There are no material conflicts between Plaintiffs' claims and those of absent Class or State Class members that would make class certification inappropriate. Counsel for Plaintiffs is experienced in complex class action litigation, including antitrust litigation, and will vigorously assert Plaintiffs' claims and those of absent Class and State Class members. Fed. R. Civ. P. 23(a)(4).

248. A class action is superior to other methods for the fair and efficient resolution of this controversy. The class action device presents fewer management difficulties, and provides the benefit of a single adjudication, economy of scale, and comprehensive supervision by a single court. Fed. R. Civ. P. 23(b)(3). The damages suffered by Plaintiffs and Class and State Class members are relatively small, given the expense and burden of individual prosecution of the claims asserted in this litigation. Thus, absent class certification, it would not be feasible for Plaintiffs and Class and State Class members to redress the wrongs done to them. Even if Plaintiffs and Class and State Class members could afford individual litigation, which is not the case, the court system could not. Further, individual litigation presents the potential for inconsistent or contradictory judgments and would greatly magnify the delay and expense to all parties and to the court system. Therefore, the

1 class action device presents far fewer case management difficulties and will provide the benefits of
2 unitary adjudication, economy of scale and comprehensive supervision by a single court.

3 249. Defendants have acted or refused to act on grounds generally applicable to the Class
4 and State Classes, thereby making appropriate final injunctive relief or corresponding declaratory
5 relief with respect to the Classes as a whole. Fed. R. Civ. P. 23(b)(2).

6 **X. VIOLATIONS ALLEGED**

7 **FIRST CLAIM FOR RELIEF**
8 **(Violations of Sherman Act, 15 U.S.C. § 1)**

9 250. Indirect purchaser Plaintiffs incorporate by reference all the above allegations as if
10 fully set forth herein.

11 251. Beginning at least as early as July 1, 2016, the exact date being unknown to the
12 indirect purchaser Plaintiffs and exclusively within the knowledge of Defendants, Defendants and
13 their co-conspirators entered into a continuing contract, combination or conspiracy to unreasonably
14 restrain trade and commerce in violation of Section 1 of the Sherman Act (15 U.S.C. § 1) by
15 artificially reducing or eliminating competition in the United States.

16 252. In particular, Defendants have combined and conspired to raise, fix, maintain or
17 stabilize the prices of DRAM Products sold in the United States.

18 253. As a result of Defendants' unlawful conduct, prices for DRAM and DRAM Products
19 were raised, fixed, maintained, and stabilized in the United States.

20 254. The contract, combination or conspiracy among Defendants consisted of a continuing
21 agreement, understanding, and concerted action among Defendants and their co-conspirators.

22 255. For purposes of formulating and effectuating their contract, combination, or
23 conspiracy, Defendants and their co-conspirators did those things they contracted, combined, or
24 conspired to do, including:

- 25 a. Communicating in writing and orally to fix prices of DRAM and DRAM
26 products.
- 27 b. Agreeing to manipulate prices and supply of DRAM and DRAM Products
28 sold in the United States in a manner that deprived direct and indirect
purchasers of free and open competition.
- c. Making supply growth decisions in accordance with the agreements reached.

- d. Selling DRAM and DRAM Products to customers in the United States at noncompetitive prices.
 - e. Providing false statements to the public to explain increased prices for DRAM and DRAM products.

256. As a result of Defendants' unlawful conduct, indirect purchaser Plaintiffs and the other members of the Class have been injured in their businesses and property in that they have paid more for DRAM Products than they otherwise would have paid in the absence of Defendants' unlawful conduct.

257. These violations are continuing and will continue unless enjoined by this Court.

258. Pursuant to Section 16 of the Clayton Act, 15 U.S.C. § 26, indirect purchaser Plaintiffs and the nationwide Class seek the issuance of an injunction against Defendants, preventing and restraining the violations alleged herein.

SECOND CLAIM FOR RELIEF

(Violations of the Cartwright Act, Cal. Bus. & Prof. Code §§ 16720, *et seq.*)

259. Indirect purchaser Plaintiffs incorporate by reference all the above allegations as if fully set forth herein.

260. By reason of the foregoing, Defendants have violated California Business and Professions Code, §§ 16700, et seq.

261. Beginning at a time currently unknown to Plaintiffs, but at least as early as July 1, 2016 and continuing thereafter at least up to February 1, 2018, Defendants and their co-conspirators entered into and engaged in a continuing unlawful trust in restraint of the trade and commerce described above in violation of section 16720, California Business and Professions Code. Defendants, and each of them, have acted in violation of section 16720 to fix, raise, stabilize, and maintain prices of, and allocate markets for DRAM and DRAM Products at supra-competitive levels.

262. In particular, Defendants have combined and conspired to raise, fix, maintain or stabilize the prices of DRAM and DRAM Products sold in the United States.

263. As a result of Defendants' unlawful conduct, prices for DRAM and DRAM Products were raised, fixed, maintained, and stabilized in the United States.

264. The contract, combination or conspiracy among Defendants consisted of a continuing agreement, understanding, and concerted action among Defendants and their co-conspirators.

265. For purposes of formulating and effectuating their contract, combination, or conspiracy, Defendants and their co-conspirators did those things they contracted, combined, or conspired to do, including:

- a. Communicating in writing and orally to fix prices of DRAM and DRAM products.
 - b. Agreeing to manipulate prices and supply of DRAM and DRAM Products sold in the United States in a manner that deprived direct and indirect purchasers of free and open competition.
 - c. Making supply growth decisions in accordance with the agreements reached.
 - d. Selling DRAM and DRAM Products to customers in the United States at noncompetitive prices.
 - e. Providing false statements to the public to explain increased prices for DRAM and DRAM products.

266. As a direct and proximate result of Defendants' unlawful conduct, Plaintiffs and the members of the Class have been injured in their business and property in that they paid more for DRAM and DRAM Products than they otherwise would have paid in the absence of Defendants' unlawful conduct. As a result of Defendants' violation of Section 16720 of the California Business and Professions Code, Plaintiffs and the Class seek treble damages and their cost of suit, including a reasonable attorney's fee, pursuant to section 16750(a) of the California Business and Professions Code.

THIRD CLAIM FOR RELIEF

**(Violations of California's Unfair Competition Law,
Cal. Bus. & Prof. Code §§ 17200, et seq.)**

267. Indirect purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

268. By reason of the foregoing, Defendants have violated California's Unfair Competition Law, Cal. Bus. & Prof. Code §§ 17200, et seq.

269. Defendants committed acts of unfair competition, as defined by section 17200, et seq., by engaging in a conspiracy to fix and stabilize the price of DRAM and DRAM Products as described above.

270. The acts, omissions, misrepresentations, practices and non-disclosures of Defendants, as described above, constitute a common and continuing course of conduct of unfair competition by means of unfair, unlawful and/or fraudulent business acts or practices with the meaning of Section 17200, et seq., including, but not limited to (1) violations of Section 1 of the Sherman Act; and (2) violations of the Cartwright Act.

271. Defendants' acts, omissions, misrepresentations, practices and nondisclosures are unfair, unconscionable, unlawful and/or fraudulent independently of whether they constitute a violation of the Sherman Act or the Cartwright Act.

272. Defendants' acts or practices are fraudulent or deceptive within the meaning of section 17200, et seq.

274. Defendants' conduct was carried out, effectuated, and perfected within the state of California. Defendants maintained offices in California where their employees engaged in communications, meetings and other activities in furtherance of Defendants' conspiracy.

273. By reason of the foregoing, the Class is entitled to application of California law to a nationwide class and are entitled to full restitution and/or disgorgement of all revenues, earnings, profits, compensation, and benefits that may have been obtained by Defendants as result of such business acts and practices described above.

FOURTH CLAIM FOR RELIEF

(Violations of State Antitrust and Restraint of Trade Laws)

274. Indirect purchaser Plaintiffs incorporate by reference the allegations in the above paragraphs as if fully set forth herein.

275. Defendants engaged in a continuing contract, combination and conspiracy in restraint of interstate trade and commerce, which had the purpose and effect of fixing, raising, maintaining and/or stabilizing the price DRAM at artificially high, non-competitive levels in the United States.

1 276. For the purpose of effectuating the aforesaid contract, combination, and conspiracy,
2 Defendants

- 3 a. agreed among themselves to fix, raise, maintain and/or stabilize the prices of
4 DRAM in the United States; and
5 b. agreed among themselves to restrict the supply of DRAM by coordinating
6 their actions.

7 277. The conspiracy had its intended effect, as Defendants benefitted from selling DRAM
8 at supra-competitive prices.

9 278. As a result of Defendants' unlawful conduct, Plaintiffs and the other members of the
10 State Classes have been injured in their business and property in that they have paid more for DRAM
11 Products than they otherwise would have paid in the absence of Defendants' business practices.

12 279. By reason of the foregoing, Defendants have violated Arizona Revised Statutes §§ 44-
13 1401, et seq.

14 280. By reason of the foregoing, Defendants have violated Arkansas § 4-75-212-315(a)(3),
15 et seq.

16 281. By reason of the foregoing, Defendants have violated California Business and
17 Professions Code §§ 28-4501, et seq.

18 282. By reason of the foregoing, Defendants have violated District of Columbia Code
19 Annotated §§ 28-4501, et seq.

20 283. By reason of the foregoing, Defendants have violated the Florida Deceptive and
21 Unfair Trade Practices Act, Fla. Stat. §§ 501.201, et seq.

22 284. By reason of the foregoing, Defendants have violated Hawaii Revised Statutes 480-1
23 et seq.

24 285. By reason of the foregoing, Defendants have violated the Illinois Antitrust Act,
25 Illinois Compiled Statutes, §§ 740 Ill. Comp. Stat. 10/1, et seq.

26 286. By reason of the foregoing, Defendants have violated Iowa Code §§ 553.1, et seq.

27 287. By reason of the foregoing, Defendants have violated Kansas Statutes Annotated §§
28 50-101, et seq.

1 288. By reason of the foregoing, Defendants have violated the Maine Revised Statutes 10
2 M.R.S. §§ 1101, et seq.

3 289. By reason of the foregoing, Defendants have violated the Michigan Compiled Laws
4 Annotated §§ 445.771, et seq.

5 290. By reason of the foregoing, Defendants have violated the Minnesota Annotated
6 Statutes §§ 325D.49, et seq.

7 291. By reason of the foregoing, Defendants have violated Mississippi Code Annotated §§
8 75-21-1, et seq.

9 292. By reason of the foregoing, Defendants have violated Nebraska Revised Statutes §§
10 59-801, et seq.

11 293. By reason of the foregoing, Defendants have violated New Hampshire Revised
12 Statutes §§ 356:1, et seq.

13 294. By reason of the foregoing, Defendants have violated New Mexico Statutes
14 Annotated §§ 57-1-1, et seq.

15 295. By reason of the foregoing, Defendants have violated New York General Business
16 Laws §§ 340, et seq.

17 296. By reason of the foregoing, Defendants have violated North Carolina General Statutes
18 §§75-1, et seq.

19 297. By reason of the foregoing, Defendants have violated North Dakota Centure Code §§
20 51-08.1-01, et seq.

21 298. By reason of the foregoing, Defendants have violated Oregon Revised Statutes §§
22 646.705, et seq.

23 299. By reason of the foregoing, Defendants have violated South Dakota Codified Laws §§
24 37-1-3.1, et seq.

25 300. By reason of the foregoing, Defendants have violated Tennessee Code Annotated §§
26 47-25-101, et seq.

27 301. By reason of the foregoing, Defendants have violated Utah Code Annotated §§ 76-10-
28 911, et seq.

302. By reason of the foregoing, Defendants have violated Vermont Stat. Ann. 9 §§ 2451, et seq.

303. By reason of the foregoing, Defendants have violated West Virginia Code §§ 47-18-1,
et seq.

304. By reason of the foregoing, Defendants have violated Wisconsin Statutes §§ 133.01, et seq.

DEMAND FOR TRIAL BY JURY

305. Pursuant to Fed. R. Civ. P. 38(b), Plaintiffs demand a trial by jury of all issues so triable under the law.

PRAYER FOR RELIEF

WHEREFORE, Plaintiffs and Class members pray for relief as set forth below:

A. Certification of the action as a class action pursuant to Federal Rule of Civil Procedure 23, and appointment of Plaintiffs as Class Representatives and Plaintiffs' counsel of record as Class Counsel;

B. A declaration that Defendants' conduct constituted an unlawful restraint of trade in violation of the federal and state statutes alleged herein and that Defendants are liable for the conduct or damage inflicted by any other co-conspirator;

C. Restitution and/or damages to Class members for their purchases of products containing DRAM at inflated prices;

D. Actual damages, statutory damages, punitive or treble damages, and such other relief as provided by the statutes cited herein;

E. Pre-judgment and post-judgment interest on such monetary relief:

F. Equitable relief in the form of restitution and/or disgorgement of all unlawful or illegal profits received by Defendants as a result of the anticompetitive conduct alleged herein;

G. An injunction against Defendants, their affiliates, successors, transferees, assignees, and other officers, directors, partners, agents and employees thereof, and all other persons acting or claiming to act on their behalf or in concert with them from in any manner continuing, maintaining, or renewing the conduct, contract, conspiracy, or combination alleged herein, or from entering into

1 any other contract, conspiracy, or combination having a similar purpose or effect, and from adopting
2 or following any practice, plan, program or device having a similar purpose or effect;

3 H. The costs of bringing this suit, including reasonable attorneys' fees; and

4 I. All other relief to which Plaintiffs and Class members may be entitled at law or in
5 equity.

6 DATED: August 16, 2018

7 HAGENS BERMAN SOBOL SHAPIRO LLP

8 By /s/ Jeff D. Friedman
9 Jeff D. Friedman

10 Rio S. Pierce (298297)
11 HAGENS BERMAN SOBOL SHAPIRO LLP
12 715 Hearst Avenue, Suite 202
Berkeley, CA 94710
Telephone: (510) 725-3000
Facsimile: (510) 725-3001
jefff@hbsslaw.com
riop@hbsslaw.com

13
14 Steve W. Berman (*Pro Hac Vice forthcoming*)
15 Anthony D. Shapiro (*Pro Hac Vice forthcoming*)
Ronnie Spiegel (*Pro Hac Vice forthcoming*)
16 1918 Eighth Avenue, Suite 3300
Seattle, WA 98101
Telephone: (206) 623-7292
Facsimile: (206) 623-0594
steve@hbsslaw.com
tony@hbsslaw.com
ronnie@hbsslaw.com

17
18 Simon Bahne Paris (*Pro Hac Vice forthcoming*)
Patrick Howard (*Pro Hac Vice forthcoming*)
Charles J. Kocher (*Pro Hac Vice forthcoming*)
SALTZ, MONGELUZZI, BARRETT
& BENDESKY, P.C.
One Liberty Place, 52nd Floor
1650 Market Place
Philadelphia, PA19103
Telephone: (215) 575-3986
Facsimile: (215) 496-0999
sparis@smbb.com
phoward@smbb.com
ckocher@smbb.com